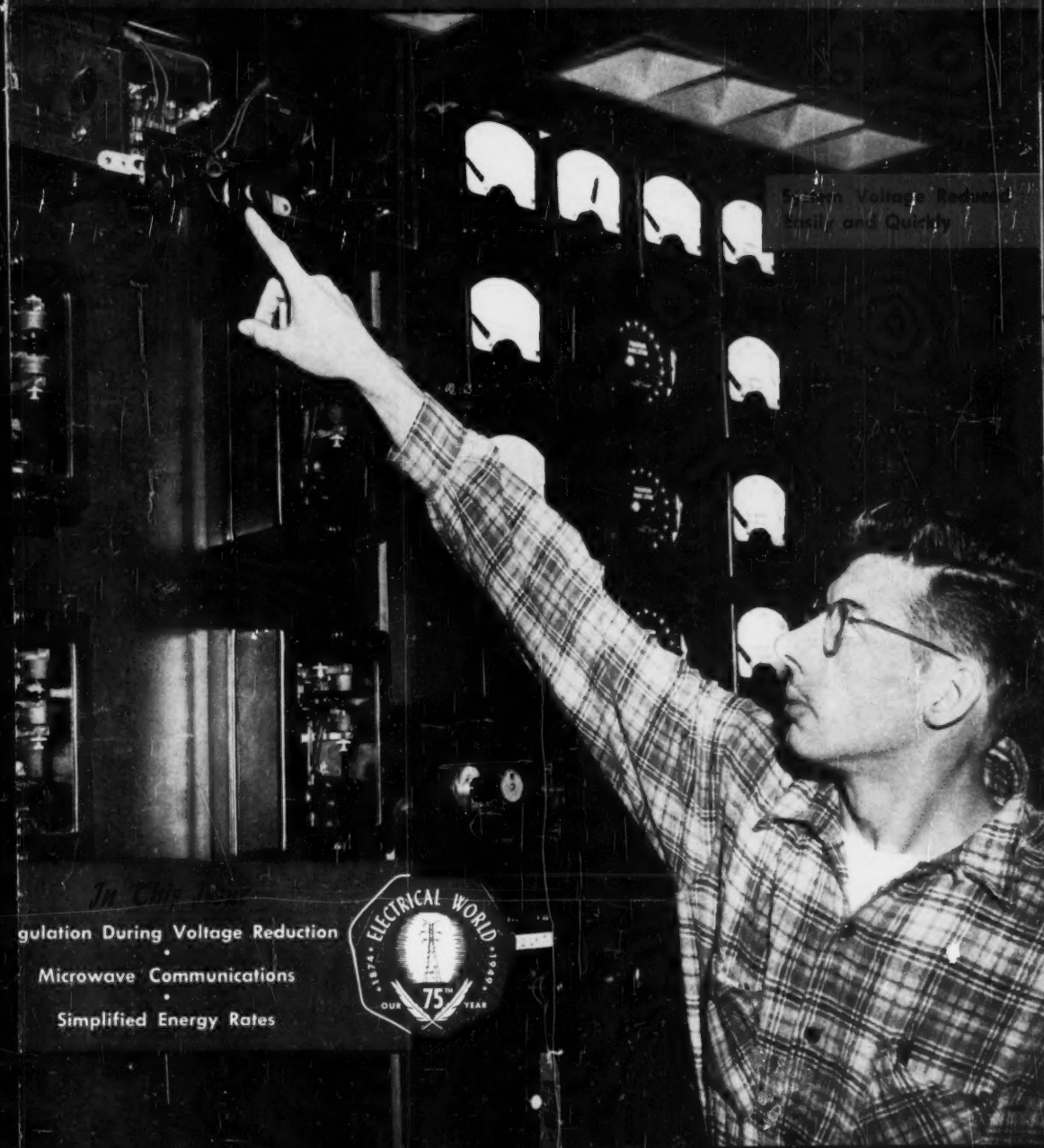
ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION

JANUARY 1, 1949



System Voltage Reduced Easily and Quickly

In This Issue

gulation During Voltage Reduction

Microwave Communications

Simplified Energy Rates

ELECTRICAL WORLD 1874 1949 OUR 75TH YEAR

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IN

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ELECTRICAL WORLD

Published for 75 years for those engaged in the business of generating, transmitting, distributing or applying electric power

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COVER PICTURE—System voltage is reduced easily and quickly by rheostats in the contact-making voltmeter circuit of voltage regulators, generators, tap changing under-load transformers, and distribution feeders. Cover photo by Dan Braymer.

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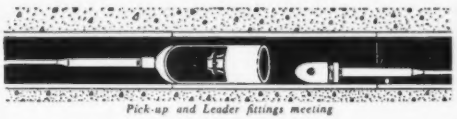
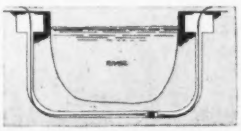


Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.



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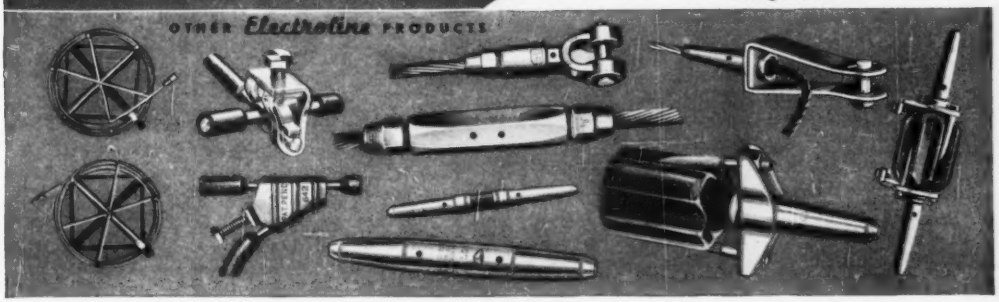

On distribution systems, whenever large capacitor banks have been installed, it has been generally considered necessary to apply oil circuit breakers for switching purposes. However, with the availability of the S & C Interrupter Switch, affording dependable switching at substantial cost savings, the oil circuit breaker is no longer a necessity in this type of application where automatic control is not essential.

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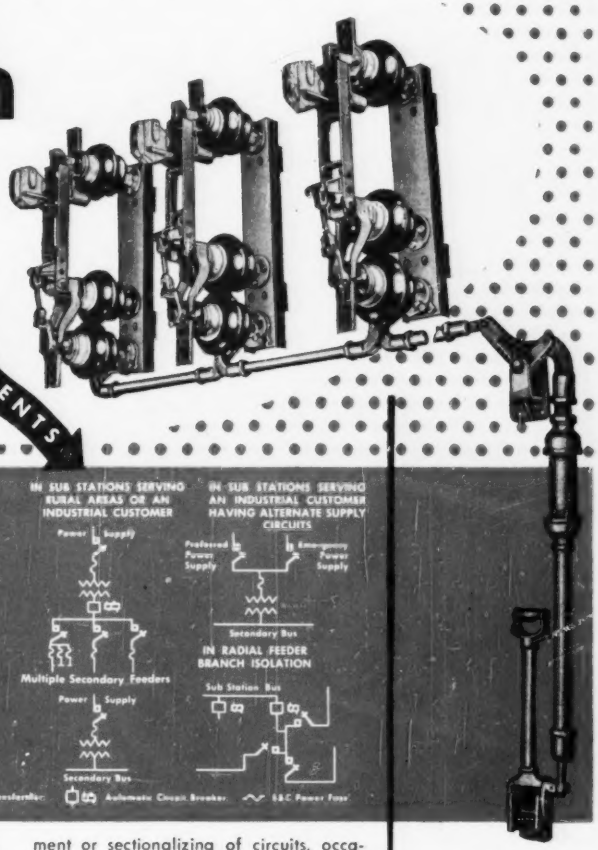
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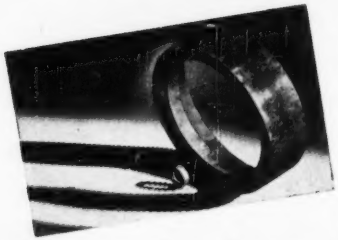

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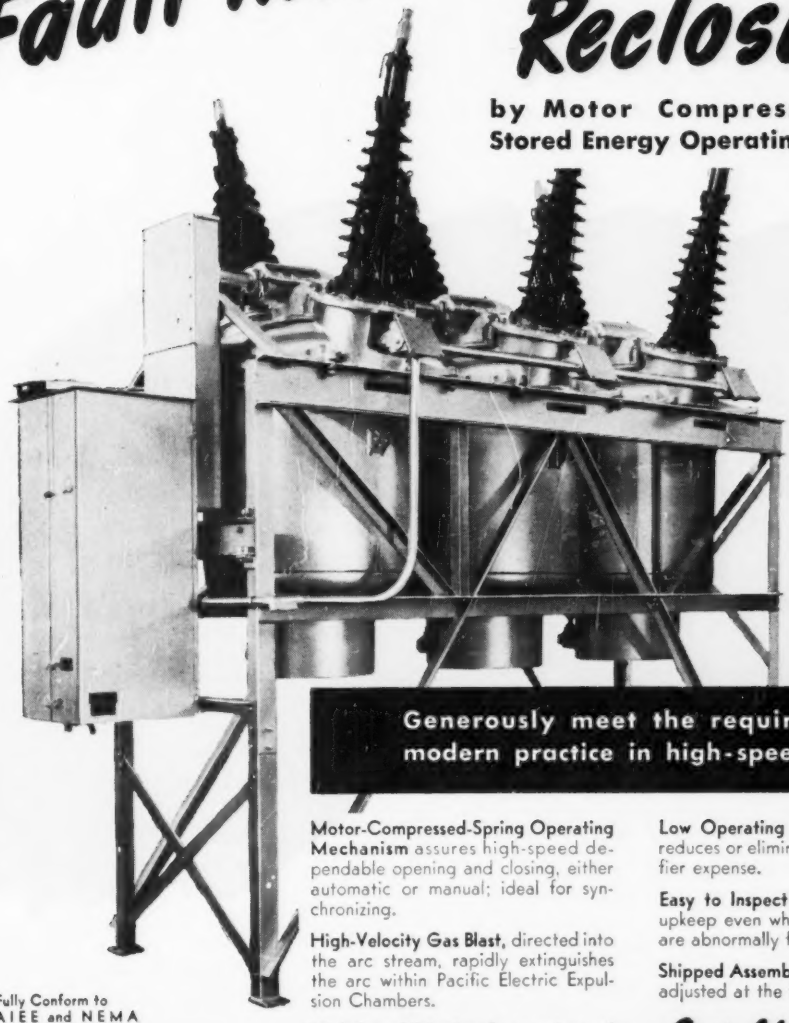

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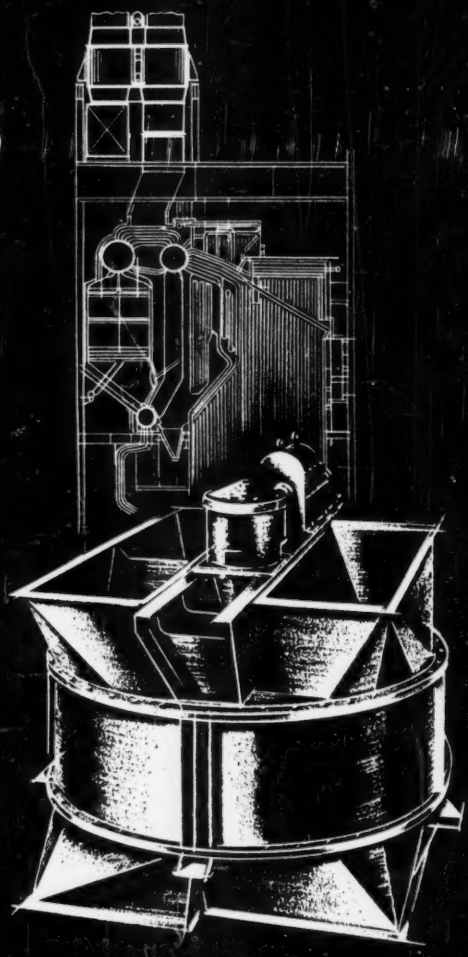

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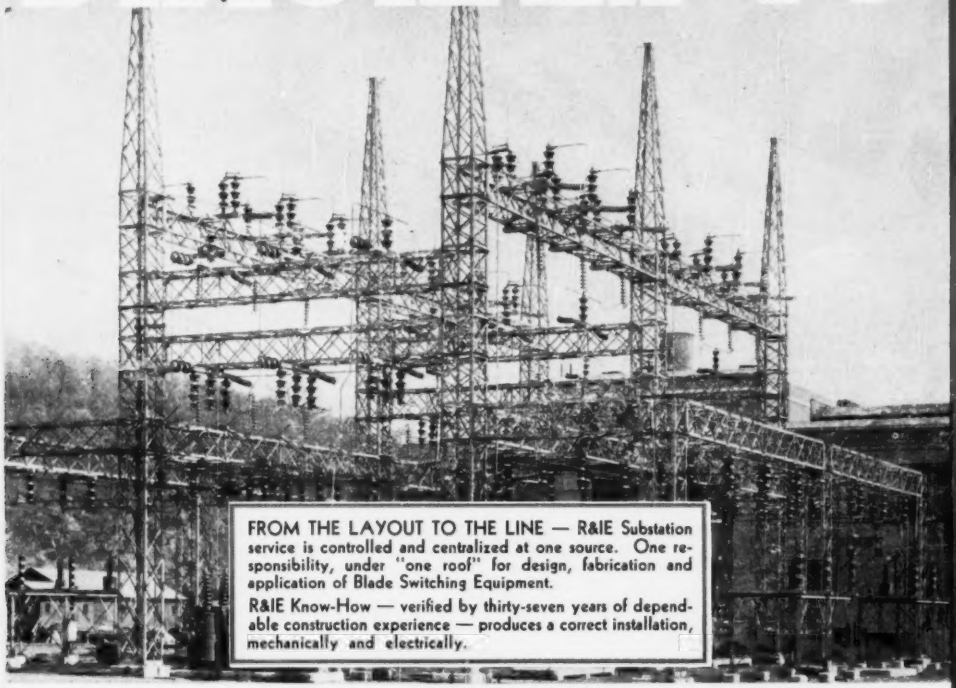

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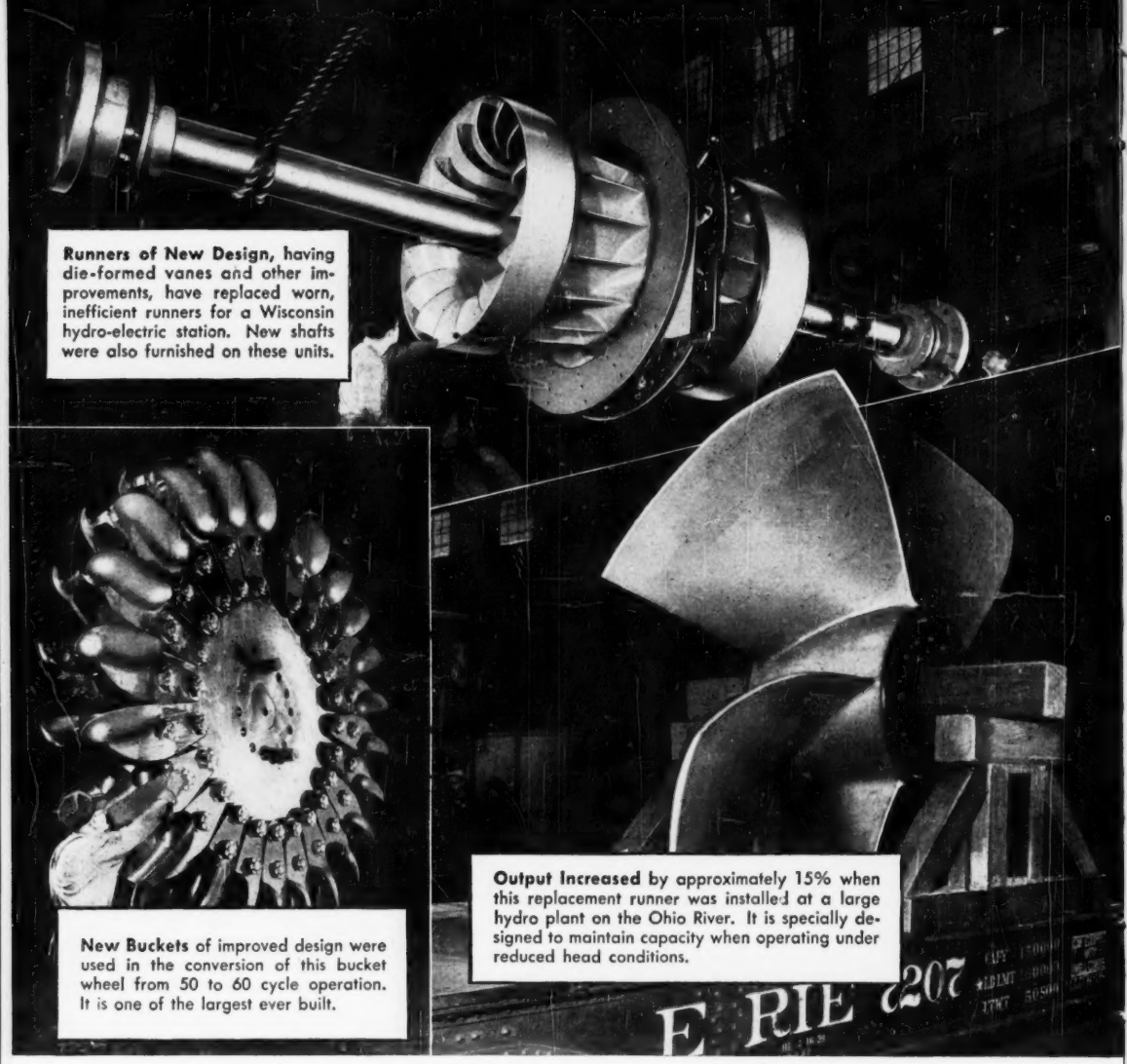

Runners of New Design, having die-formed vanes and other improvements, have replaced worn, inefficient runners for a Wisconsin hydro-electric station. New shafts were also furnished on these units.

New Buckets of improved design were used in the conversion of this bucket wheel from 50 to 60 cycle operation. It is one of the largest ever built.

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Installed horsepower of Allis-Chalmers turbines totals more than 10 million HP in all principal types — impulse, Francis and propeller. In addition to turbines and auxiliaries, Allis-Chalmers builds generators, power transformers and switchgear for the hydro power industry. It is the *only* company with centralized facilities for coordinating hydraulic and electrical experience.

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A 2575

Model runner tests authorized by owner of 30 year old power plant resulted in purchase of large new-design Francis runners (left) for improved performance.

Automatic cabinet-type governors like these have recently replaced less sensitive, manually operated equipment at power companies in Pennsylvania and in North Carolina.

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CHALMERS

Electrical Equipment from Generation through Utilization

The case of the Creeping Sleeve

Lead sheathing on telephone cable meets many stresses – the tug of its own weight, wind pressure, contraction and expansion from cold and heat. Then, too, there's the pressure of nitrogen gas put in Long Distance cable to warn of sheath breaks and keep out moisture.

And, sometimes, lead is subject to "creep"– a permanent stretching – even when the stress is but a fraction of the normal tensile strength. Creep is especially likely at the lead sleeves used where two lengths of cable are joined. The sleeve may stretch and break open exposing telephone circuits to the elements.

So Bell Laboratories scientists have developed methods to test and control creep. In a special testing room, weights are applied to scores of samples of lead, under controlled conditions. Exact records of the amount of creep are obtained with a precision instrument.

Years of careful study have produced a lead composition which resists creep and yet has all the other properties required of sleeves. This means better telephone service for you and helps give that service at lowest possible cost. It is an example of the way Bell Telephone Laboratories scientists study and improve every part of the great telephone plant.

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- Varnished cable tape
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- Varnished Fiberglas cloth
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THE NATIONAL VARNISHED PRODUCTS Corporation

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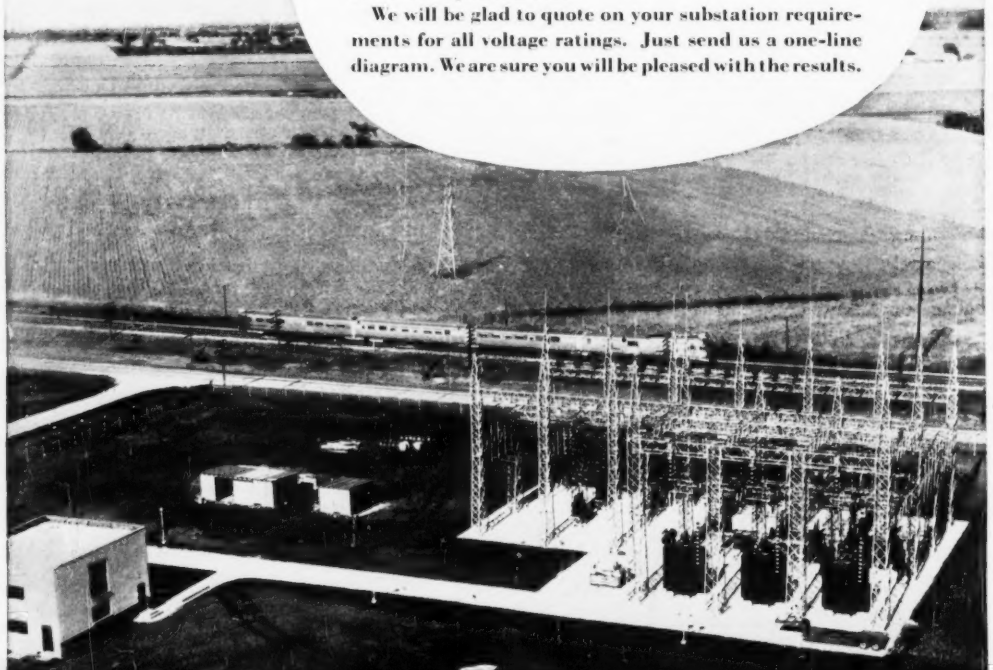
A TYPICAL AERIAL VIEW OF THE GREAT MIDWEST

Showing the lush fields, concrete highways, streamlined transportation and a DELTA-STAR outdoor substation equipped with modern MK vertical break switches.

This substation, installed by a large utility, is a step-down station, 138 Kv to 69 Kv. Initial installed capacity are 3-8333 KVA single phase transformers.

DELTA-STAR with over thirty-seven years of experience, has developed production methods for turning out "Custom Made" substations to meet your specific needs. Control of fabrication insures accurate punching of steel members and facilitates erection of structures. Control of hot-dip galvanizing is your insurance of permanence.

We will be glad to quote on your substation requirements for all voltage ratings. Just send us a one-line diagram. We are sure you will be pleased with the results.



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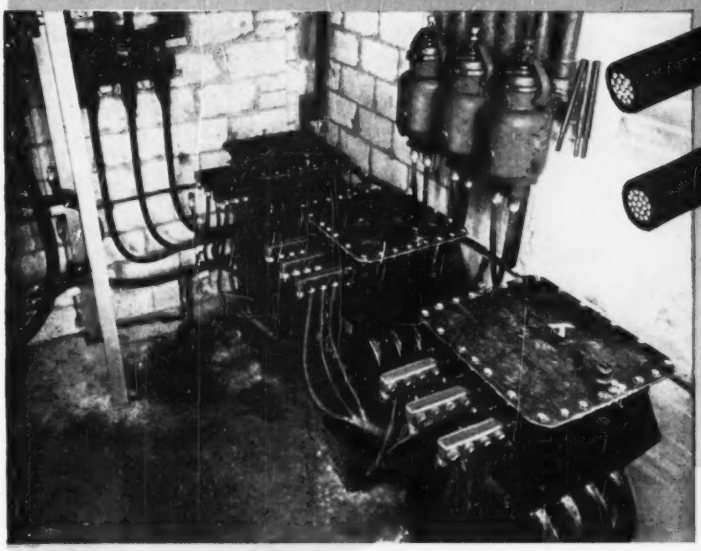
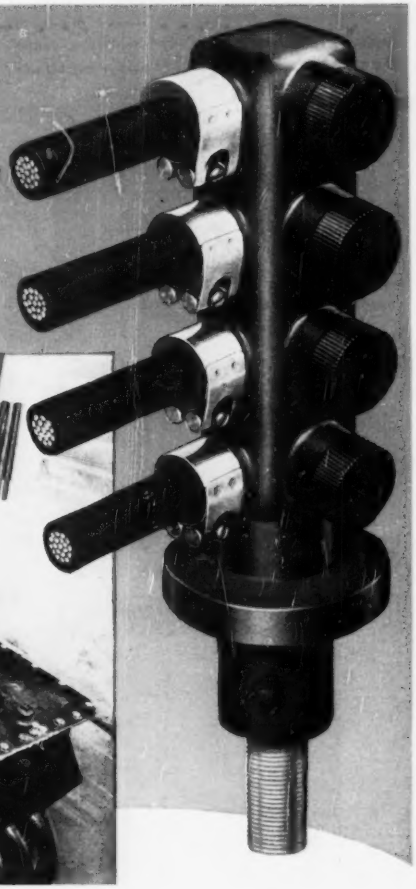
(Type KMLD)





Simplifies multiple connections to transformers . . . underground

TYPE KMLD Stud Mole, insulated with oil resistant Neoprene, provides the simplest, quickest means for making secondary connections at the transformer itself, eliminating many joints and junction boxes. Cables are quickly connected to the Stud Mole merely by inserting ends into outlets, and tightening socket head pressure screws. Phenolic insulating plugs cover the screws. The joint is completely sealed by tightening the non-corrosive clamps around the outlet insulation. NO TAPING NEEDED. Clamping plates seal KMLD to transformer housing without need for porcelain bushings. Each outlet accommodates the rubber insulation on all conductors up to 4/0, through use of bushings for smaller cable sizes. Type KMLD may be installed by the transformer manufacturer or by purchaser after consulting the manufacturer.

Bulletin 48Z1 gives full details on KMLD, as well as on Type KME Mole for low capacity use in light load areas. Ask your Burndy representative, or write direct for your copy.

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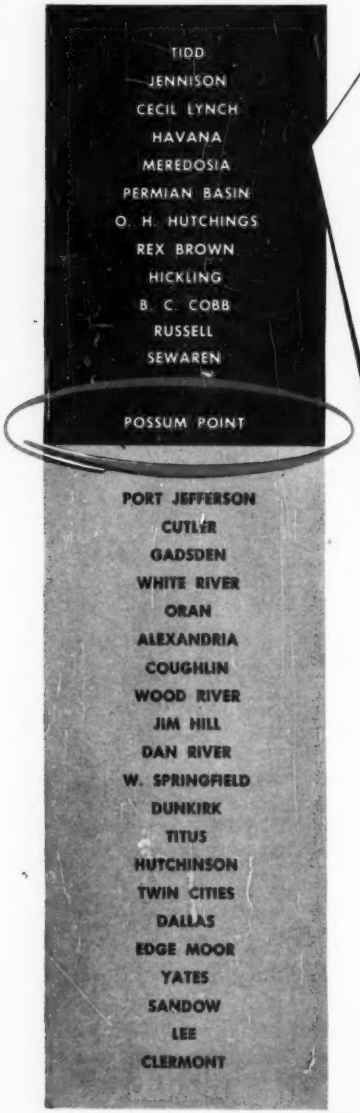
NEW UTILITY STATIONS C-E EQUIPPED

Includes stations placed in operation since the war (in white) and those under construction or being engineered.



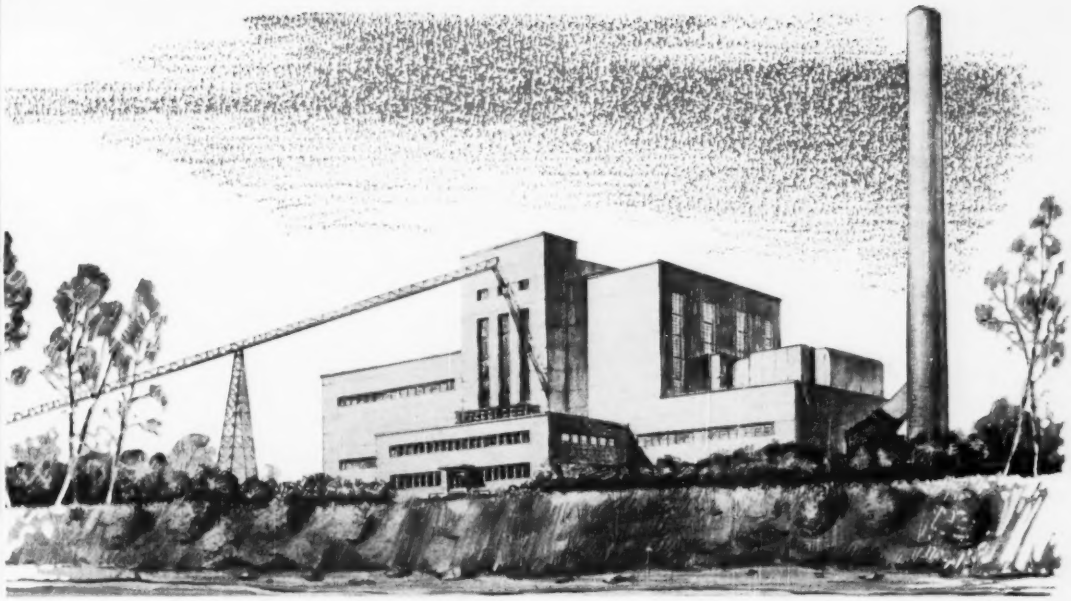
New Possum Point Station goes into service

Another 60,000 kw of electric power was added to the system of the Virginia Electric and Power Company in the latter part of November when the first unit of its new Possum Point Station went into service.

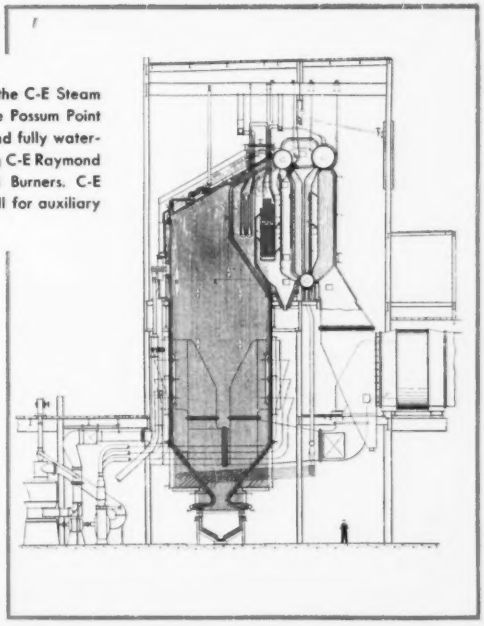
Located on the Potomac River near Quantico, Virginia, this new station is situated where it will not only handle the rapidly growing power demand in Arlington and Fairfax counties and in Alexandria,

COMBUSTION

C-E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS



The cross-sectional elevation at the right shows the C-E Steam Generating Unit which recently went into service in the Possum Point plant. It is a 3-drum boiler with 2-stage superheater and fully water-cooled furnace. Pulverized coal firing is employed, using C-E Raymond Bowl Mills and C-E Vertically-adjustable, Tangential Burners. C-E Horizontal Burners are installed in the upper front wall for auxiliary firing as required.



but through transmission connections will increase the total capacity of the Virginia Electric and Power Company System.

The new 60,000-kw turbine-generator is served by a C-E Steam Generator—arrangement of which is shown at the right—designed to supply steam at 850 psi and 900 F. This unit is practically a duplicate of one now in process of fabrication for the Chesterfield Station of the same company. B-282

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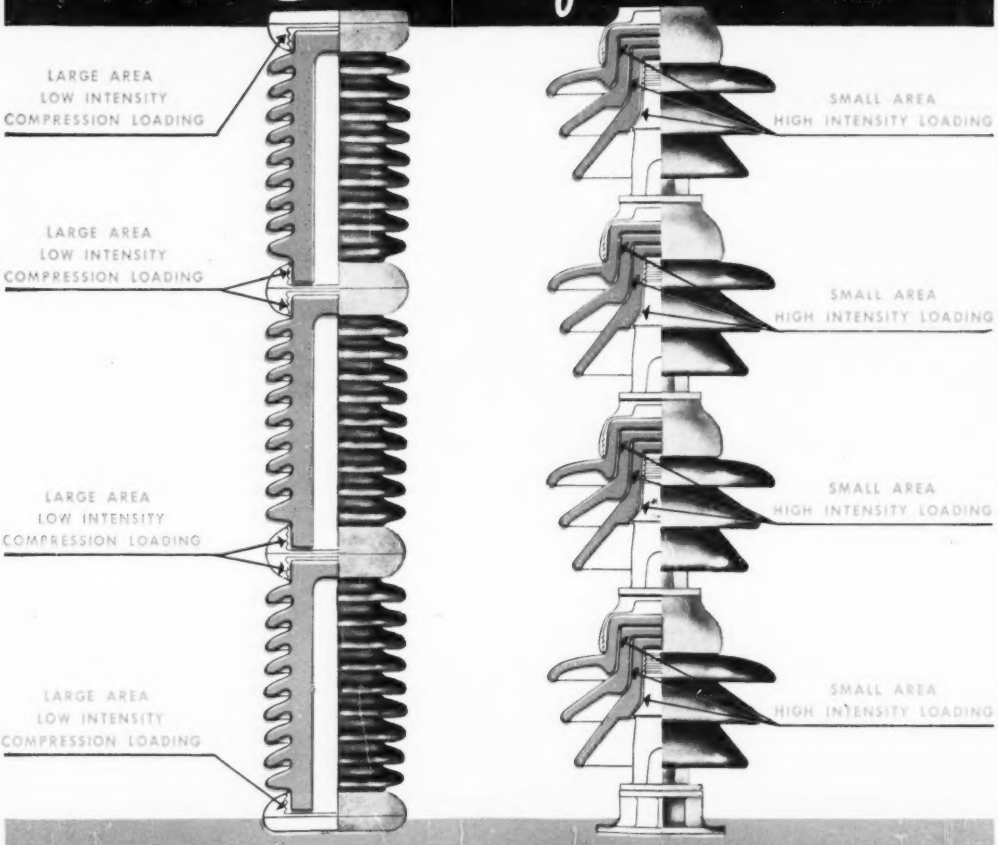
200 MADISON AVENUE, NEW YORK 16, N. Y.

V V Compare!



Mechanically and Electrically LAPP STATION POSTS Are The Choice For Switch and Bus Support At 115-161 Kv.

Shown above are a Lapp Station Post for 138-161 Kv, and a conventional pin-type station insulator of the same voltage. From the standpoint of rigidity and permanence compare the Station Post's six large-area low-intensity compression-loading cemented joints with the other design—twelve small-area high-intensity nested-porcelain joints. Which design do you think has the best chance of survival under stresses from thermal change, under torsion load, cantilever load and impact? Why would anybody specify the pin-type design when he can get the security of Lapp Station Posts—up to 161 Kv?

Lapp STATION POSTS

LAPP INSULATOR CO., INC. • LE ROY, N.Y., U. S. A.

Another KEARNEY Triumph

A New Low-Cost Secondary Fuse Cutout

- **Isolate service entrance faults**
- **Protect transformers from secondary faults**
- **Make banking of secondaries possible**

The demand for this Secondary Fuse Cutout was brought about by the successful use of Kearney Secondary Fuse Links.

Sturdily made of weather-resisting, non-metallic material (except for fuse link and spring), this unit transfers current from the secondary to the tap directly through the link itself with no intermediate connection or transfers.

The simplicity of design, without nuts or bolts to tighten, makes it possible to refuse and install this cutout in less than twelve seconds.

Just 3 Easy Steps to Refuse

STEP ONE: Drop the fuse link in the top opening of the cutout. Then, compress the lower shell and insert the tap wire in the hole provided in the link.

STEP TWO: Compress top shell and twist to the right or left so that it stays in the open position.

STEP THREE: Hang the cutout on the secondary, release top shell by twisting to make the final pressure contact with the secondary.

FOR BETTER CONSTRUCTION AND MAINTENANCE

Always Specify KEARNEY PRODUCTS *for the Job*

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"Give us the tools . . ."

What Are *YOUR* Chances If There Are No Profits?

Since the November 2 election there has been a dazzling variety of plans to have the government do more and more things and spend more and more money. But there is almost no variety in the plans which are suggested to raise the money.

"Pay for it by taxing profits," is the standard refrain. Slap on an "excess" profits tax. Boost the corporations' income tax rate.

Well – why not? Haven't the corporations been making so much money that a big chunk of it can be turned over to the government spenders without hurting anybody?

The answer is no!

How high profits should be can be debated endlessly. Some people claim that 1948 corporation profits, which will amount to about $20 billion, are too high. They emphasize the fact that profits are larger in relation to investment than they were a few years ago. Other people think profits are low. They stress the fact that profits are not much larger in relation to sales than they have been historically. Both sides agree that in some individual cases profits have been too high, as in others they have been too low or non-existent.

But if we cut the total volume of profits drastically, we shall do so at our national peril.

There is no room for debate about that. For we shall choke off the crucially important job of building new plants and equipment for our industries. Squeeze hard enough, and America will go the way of Britain – down the long and painful skid of industrial decline. Widespread unemployment, especially among our industrial workers who produce new plants and equipment, will mark the dreary way. Here is a fact which the President, the Congress, the C.I.O., and all of us have a real reason to remember:

Almost two-thirds of all profits today are going to rebuild and improve plants and equipment.

More than $13 billion of this year's profits are being plowed back. They are going – as a large proportion of profits have always gone – to buy for workers better tools to work with, better surroundings in which to work. They are making possible better products, and more of them, for all of us.

The figures below show how companies have put more and more profit-dollars and a larger share of their profits to work in the business:

YEAR	PROFITS REINVESTED	% OF TOTAL PROFITS
1929	$2.6 billion	31%
1939	1.2 "	24%
1943	5.9 "	57%
1944	5.2 "	53%
1945	4.2 "	47%
1946	6.9 "	55%
1947	11.2 "	62%
1948 est.	13.0 "	65%

continued on next page

The record shows that each of us is the real beneficiary of this plowing back of profits.

Every American has benefited from these profits. Each dollar that business has put into its plants and equipment in the last thirty years has increased our yearly production by 35 cents.

This re-investment of profits has helped make possible a 75% increase in living standards since 1919.

It has helped increase wages from an average 48 cents an hour in 1919 to $1.36 today. Allowing for higher prices, that increase means that an hour's work today will buy twice as much as it did thirty years ago.

Why must business retain these billions of profits to improve its plants and equipment? Why must it plow back more and more? *The reason is that business already is caught in a tax squeeze.*

Federal taxes alone take at least thirty-eight of each one hundred dollars a company earns. Then, if the company pays out to its stockholders any part of what is left as dividends, the federal personal income taxes of the stockholders may take up to 77% of those dividends. Under these conditions, so few people are willing to invest in industry that the stock market is stagnant. Companies can not raise in that market the money they need for improvements.

The result: business must rely more and more on plowed-back profits to pay for new plants and equipment.

We know that everywhere in industry new and better ways of producing goods are standing ready for use. The previous editorial in this series mentioned some of them. We know, too, that depression and war put our industries far behind schedule — as much as $100 billion behind — in getting the new tools they should have had to keep themselves in first-class shape. McGraw-Hill is now completing a survey of industry that will measure these needs. The results will be published in this editorial series. We know already that in 1949 alone industry will need $18 billion or more for this purpose.

And all but a small fraction of that sum must come from profits.

Our prosperity, our strength as a nation, our hopes for better living depend on our continuing to generate and to plow back a large volume of profits.

For that reason we should not thoughtlessly follow these people who propose to pay for any and all new government activities by saying simply, "Soak the corporations." There is no need to follow them. There are other ways of obtaining necessary funds.

First and foremost should be economy within the government itself. If its citizens must pay still higher taxes, then surely government should exercise rigid self-restraint, cutting out all but the most essential activities and expenses.

After economy should come consideration of a broader federal tax base.

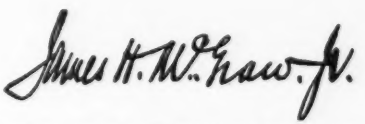
If these and other methods of raising money are inadequate and if taxes must take a bigger bite from business profits, two facts are clear. We should not adopt an "excess" profits tax with all of its complications and all of its corrupting effect on business. A moderate increase in the regular income tax on corporations is much less dangerous. *But even such an increase, if necessary, should be accompanied by special allowances for expansion and depreciation that will encourage companies to continue spending their earnings for new plant and equipment.* We all have a stake in that.

At this critical juncture in our history profits have a new and vastly more important role than they have ever had. In unprecedented degree they are the drive behind our present prosperity and the key to a better, stronger future.

Give profits the axe and the blow does not stop there.

It cuts into the employment, the prosperity and the strength of our nation.

Everyone of us has a stake in how the President and Congress handle taxes on profits — and now is the time to remind them of that stake.



President, McGraw-Hill Publishing Company, Inc.

Like Money in the Bank

WHEN you invest your cable dollars in Kerite cable, you can expect cost savings to extend over many years of service... automatic savings that result from Kerite's exceptionally long life.

We can show you samples of Kerite cable—taken out of active service—that were made nearly 70 years ago and that are still in first-class condition, both electrically and mechanically! The insulation we make today contains Kerite made to the same formula.

Kerite has often been imitated, but never been duplicated.

Regardless of your cable requirements—high or low voltage... for aerial, underground, or submarine installation—it will pay you to check with a Kerite engineer. He will draw on our long experience to recommend the Kerite cable which will fit your needs best, and let you take full advantage of Kerite insulation. The Kerite Company, 30 Church Street, New York 7, N. Y. Offices also in Chicago, Los Angeles, San Francisco.

Kerite Insulation—Your Cable's Best Life Insurance

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Reheat Can be Unprofitable

THERE IS LITTLE DOUBT about the thermodynamic gains possible when steam is resuperheated, provided resuperheat is applied where pressure and temperature are up in the brackets where advantageous. High fuel costs provide a great incentive to return to a technique that proved effective and practical in an earlier favorable period. Reports at the recent ASME meeting indicate that resuperheat *per se* has introduced no very annoying operating problems. Control of temperature does, however, have to be provided anew for the reheat operation.

Admittedly resuperheat entails more expense for piping and valves; there is also an additional tube section in the boiler. Conversely, there is less coal, steam, and condensing water to be handled because of the gain in thermal efficiency. As a consequence the condensers and several of the auxiliaries can be of lower rating and cost.

But that still leaves open the question whether reheat pays, either at the start or in the long run, when all factors, including costs, are considered. These cost factors manifestly bring the pro and con balance "near the fence" because a considerable number of decisions have been made in favor of reheat and more have been made against it. There still is plenty of capacity to be committed, and those faced with the decisions undoubtedly would welcome help from others along such lines.

Does a resuperheat installation cost less or at least no more than a non-reheat job, and is, therefore, the fuel saving gained intact? If it does cost somewhat more than a non-reheat job, is it enough more for the carrying charges to obliterate the annual fuel savings? Even if the net fuel saving is attractive during the first few years of high plant factor and base-load operation, will it be that good after the plant has been pushed down the plant factor scale by newer units elsewhere?

There's only one way to look at this dilemma about resuperheat and that is to put down in parallel columns a representative number of analyses of comparative costs (a) with resuperheat and (b) without resuperheat. Utilities that have made the comparisons and made the decisions must have such guiding data as well as a realization of special local circumstances which made the adoption feasible or unfeasible.

Of course, there is always an excusable amount of reticence in disclosing such costs in identifiable manner. But ELECTRICAL WORLD's Steam Station Cost Surveys have been a frequent means for presenting similar data in *unidentified* manner. Unfortunately those particular tabulations do not afford a chance to compare the *same* installation treated both ways. However, the columns are open for a similar unidentified and thoroughly authenticated presentation of the economic merits of resuperheat in terms of comparative costs—with it and without it.

Needed: Two Bootstraps

FROM TIME TO TIME, ELECTRICAL WORLD has expressed the opinion that Britain wasn't doing right by its electric power industry. In venturing this opinion, we weren't referring to the nationalization. Rather, we were getting at the fact that Britain seemed to have decided it couldn't afford a power industry capable of meeting and staying reasonably ahead of the demands.

The sorriest fears we might ever have had are confirmed by the following, which comes from the "Electrical Review" for last Nov 19:

"Many people in the electrical industry are becoming perturbed about conditions and prospects and some are becoming suspicious. Everybody realizes that the war stretched the country's industries and general economy to the limit—and beyond—and that progress was bound to be retarded. There has arisen a feeling, however, that retardation of electrical progress has gone too far, due either to an imperfect realization of the consequences or a tendency to ignore them in an attempt to prevent electrical development at the expense of other methods.

"When the war finished there was, for a short space, a sufficiency of plant but it soon became apparent that industry would have to continue to operate at the high level reached during the war and that the suppressed domestic demand would have to be satisfied. The Central Electricity Board prepared a programme to meet the situation but the Government decided, partly because of shortage of materials and partly on account of the need for economy in capital investment, that the programme should be substantially reduced. The public have been following an ever-receding carrot. They were first told that supply would catch up with demand by 1950. Since then, the date has been advanced several times and now 1954 is being mentioned.

"To back up its decision, the Government has had first to enforce load spreading in industry, which does not conduce to efficient operation, secondly to compel commercial undertakings to reduce their demand, and finally to threaten the domestic consumer with deprivation if she does not keep off the peak. The threat in the last case has been reinforced by a half-hearted attempt to make the cost of electricity prohibitive during the winter.

"Increased production by industry is impossible without extending electrification. Our American friends who have come over to advise us on production have already indicated that without the tools, (this time electricity) our industries cannot be expected to accomplish the programme which the Government has put before them.

"When fuel economy was said to be the first essential, electricity consumers were treated very badly in comparison with gas users. Now that plant shortage is the trouble, the gas consumer is apparently not affected. Indeed, the gas industry has occasionally implied that it is in a position to take over all the domestic water heating and cooking if necessary.

"This policy (which is underlined by a punitive purchase tax on water heating and space heating equipment) is now showing its effects. Makers of domestic electrical appliances, deprived of a home market and unable to sell their goods in overseas countries, are having to stand off workpeople or close down entirely and this is likely to spread to other branches.

"Thus it is that perturbation and suspicion are about. The suspicion is the Government is endeavoring to set back the clock and force the people to use other agents than electricity in their homes. If this is true two important points are being ignored: The people will insist on having electricity if they want it and unless the nationalized electricity service is allowed to develop naturally, it will not pay its way. This would be a strange method of 'selling' the nationalization idea to the public."

The situation of which "Electrical Review" complains here is due, of course, to governmental decision. It exists independently of nationalization, would continue to exist if the properties were turned back tomorrow to their former owners. It probably was a sincere decision, and it must have mustered some serious arguments in its behalf. It was the decision that to regain its former position, Great Britain had to skimp at home and export all possible British produce so that it could command foreign currencies. Very broadly speaking, it was part of a courageous national policy aimed at pulling the nation up by its bootstraps.

The sad part of it is Britain didn't realize that if you're going to do that, you must have a bootstrap to tug on. In short-changing itself on power, Britain forgot the bootstrap.

Steelman for Hill in NSRB

President Truman has appointed John R. Steelman to head the National Security Resources Board. This follows the resignation of Arthur M. Hill, who organized NSRB and ran it until he left in a huff, recently, when some of Washington's shinier brass disagreed with Hill's ideas of NSRB's place in the sun.

It's entirely likely that at least some leaders of the privately owned electric power industry won't really weep about Hill's demise. It was under Hill's leadership that NSRB went into a highly political star chamber session last spring on the not-so-pressing power supply problem of the Southeast BEFORE it called an open meeting on the far-more-serious power supply problem facing the Northwest. That was a marked departure from the tried and proven methods which OWU used during the war. It wasn't so good. In Hill's favor, one must add that he was considerably less "cute" on the NSRB aluminum-power study.

We don't imagine that Steelman will be anyone's man in NSRB but Mr. Truman's. On power, that would make him a public ownership man. Whatever his motivation, he won't go far wrong on power if he takes a long look at the OWU record—and then matches it.

The Electrical Week

December is over, and the electric utilities met all demands. Though too early to tell, it appears that the demand peak was lower than anticipated; so the margin of reserve was higher, probably about 6% . . . Westinghouse Electric has entered the atomic energy picture. It has signed a contract with AEC to build a reactor near Pittsburgh. Goal is an atomic power plant that will lead to an engine capable of driving a submarine . . . EEI President Ernest R. Acker in a year-end statement announced the records and gains of 1948—more than 4,000,000 kw of generating capacity added, output of approximately 282 billion kwhr, over 2,000,000 additional customers connected . . . From American Gas & Electric Service Corp's Phil Sporn came the fifth progress report on the heat pump. Much is being done to find and eliminate the bugs. One discovery is that in many areas the earth itself is not a good heat source . . . And in Cleveland, blame for the Dec 9 blackout was placed on faulty reactors. All of this type are to be replaced by Cleveland Electric.

ECA is still relying on statistics of the Commerce Department's Office of International Trade which show that too much aluminum has been re-exported to the United States from some European countries. ECA has cut down aluminum allocations to the countries, which are claiming that the metal was not re-exported but only passed through their countries on route from somewhere else.

Oil shales and other types of marine sediment that contain small amounts of uranium are being studied by the Atomic Energy Commission as possible sources of fissionable material.

Soft coal production is so far ahead of demand that many coal operators would not care if John L. Lewis called an extended holiday for his miners.

Chairman David Lilienthal of the Atomic Energy Commission doesn't believe that atomic power will be held back for lack of fuel. Statements that uranium supply is too small to permit atomic-electric generation are "simply not so," Lilienthal told a recent Denver press conference.

Don't count National Security Resources Board out as the administration agency for anticipated allocations and priorities. Commerce Department still has the edge for the job, but John Steelman, acting NSRB chief, is making a study of the issue for the President. His decision probably will be decisive.

The Armed Services expect Congress to give them more than the President's budget limit of $15 billion. But Truman advisors point out that he can prevent their spending any more than that amount, regardless of Congressional action. He may do so to avoid deficit spending and still take care of social and other domestic programs.

More and more of the ECA dollar is going for industrial commodities. The jump has been from 41% in the first ECA quarter to 60% during the first half of the third (Oct. 1-Nov. 15) quarter. Main reason for the change is that Europe's food production in 1948 jumped 25% over 1947.

Since Regulation W went into effect, many postwar utility appliance salesmen are reported quitting. They have found that they can't win sales in competition against old-timers with training and experience

Congress will give Interior Department more money for the Southwestern Power Administration this year. Interior also will seek formal Congressional authorization of SPA, which was set up by order of former Secretary Ickes.

Truman is confident, but other backers of the St. Lawrence seaway and power project are secretly dismayed over new cost estimates for the development. The Army Engineers set the price at $1.2 billion recently, an increase of about $400 million over their last previous estimate. And expansion of Great Lakes-St. Lawrence port facilities, necessary with a seaway, would raise the total investment to staggering proportions.

Agriculture Department has prepared legislation calling for federal loans for rural telephone service. It would encourage establishment of telephone co-ops, like the power co-ops financed by REA. REA might get the new loan program or a new agriculture agency might be set up. Either way REA staffers would be used.

Notes From The News

Pennsylvania Power & Light Co has received permission from the Pennsylvania Public Utility Commission to purchase the Palmerton Lighting Co for $293,182 . . . During the 1948 fishing season there were 22,000 registrations for permission to fish in the lake formed by the Safe Harbor Dam of Safe Harbor Water Power Corp on the Susquehanna River . . . Officials of Buffalo Niagara Electric Corp have categorically denied that any shortage of power exists in its area. This was in rebuttal to Gov Thomas

OUT GO THE GAS and in go electric street lights in Bratenal, a suburb of Cleveland. Originally, the lights burned gasoline vapor

E. Dewey and officials of the Aluminum Co of America, who were boosting the St. Lawrence power project . . . In a pamphlet, "100 Things You Should Know about Communism and Labor," the House Un-American Activities Committee lists the United Electrical Workers as one of the 20 CIO affiliates who are or who have been under Communist control.

Delays in the construction of natural gas pipelines have been due mainly to the shortage of steel pipe, a survey by FPC revealed . . . A Senate subcommittee investigating profits, prices, and possible tax rises was told by President Charles E. Wilson that General Electric Co feels that its profit margins are "lower than they should be to provide the necessary cushion to protect us against any sudden drop in the market." . . . As customary, Gaffney, S. C., municipal system provided free electricity for its customers in December . . . Broussard, La., has reduced its tax rate from 7 to 5 mills, and the mayor gave the Gulf States Utilities Co credit for the reduction. The utility in 1947 purchased the municipal power system, reduced rates, and became a taxpayer.

Three employees of Ebasco Services, Inc, have gone to Greece to make basic studies of electric and water systems under a contract awarded by the Economic Cooperation Administration . . . Pennsylvania Water & Power Co has filed suit in the United States Court at Baltimore to void a 1931 contract which it claims puts the Consolidated Gas, Electric Light & Power Co in a position of managerial control . . . Gulf States Utilities Co has joined the long list of utilities using a postcard billing system . . . May, 1949, has been designated National Water Systems Month by the National Association of Domestic and Farm Pump Manufacturers . . . Judge Roscoe C. O'Byrne has been appointed chairman of the Indiana Public Service Commission.

Financial:

Public Service Co of Indiana has decided against selling a planned $12,000,000 issue of preferred stock but will sell bonds in the same amount. The stock will not be sold until funds are needed for construction, some 12 months or more away . . . Benton County (Wash.) PUD has sold a $325,000 revenue bond issue to Ballard & Hasset, Des Moines, to finance a construction program. The 30-year issue has a 3¾% interest rate . . . FPC has set the actual legitimate original cost of two of the three dams comprising Pacific Gas & Electric Co's Pit River, Calif., hydro project to be $14,176,096.33.

Appalachian Electric Power in its business year ending Oct 1 earned $20.95 a share on its preferred stock as compared to $24.70 in 1947 . . . El Paso Electric Co has received FPC permission to issue and sell to a group of banks $1,500,000 in 2% promissory notes . . . Middle West Corp has authorized a liquidating distribution of one share of Kentucky Utilities Co $10 par common for each two shares of the corporation's issued and outstanding capital stock . . . FPC has authorized the merger of Eastern Massachusetts Electric Co into New England Power Co. All outstanding capital stock of both is held by the New England Electric System.

Construction:

Carnegie Institute of Technology, Pittsburgh, will spend over a million dollars on a power plant and a steam and electric distribution system . . . Seattle City Light is considering erecting a building to be used as load dispatching headquarters. From a high tower surmounting the building, communications will be exchanged by direct air-beam with major substations throughout the city . . . To speed the conversion of the Southern Ontario system from 25 to 60 cycles, the Ontario Hydro Commission has signed a contract with Canadian Comstock Co to change consumer equipment . . . A new boiler is to be installed in the Herkimer, N. Y. municipal power plant. Capacity is to be 40,000 lb of steam an hour at 460 psi.

Did December's Peak Loads Falter?

Power Supply Experts Believe Demand Was Less Than Predicted; Spot Check Tends to Verify This; Explanations For Increase Include Business Decline

POWER SUPPLY experts collectively held their breath this week waiting to see if it were really true—the first break in the steady upward march of electric power demand in 27 months.

It was too early to tell finally. And even if it proved to be true, there was no way of knowing whether it heralded the long-predicted recession, or only a temporary breathing spell before a new upward spiral. But you could get bets in New York this week (Dec 28) that the 1948 December peak load would be down—perhaps substantially—from estimates made three months and less ago.

Higher Reserve Seen

At Edison Electric Institute this week officials spoke—admittedly speculatively—of a December peak which would have yielded a reserve margin from 6 to 8%, more likely the former. That would be up from 33 to 50% over the margin EEI had anticipated—4%—in a loads and capacity survey some months ago. It would be even more above the 3.4% reserve margin predicted early this month by the National Security Resources Board—if median hydro conditions prevailed on peak.

A survey of about one third of the nation's central station capacity by ELECTRICAL WORLD early this week showed six of eight large interconnected systems had pre-Christmas December peak loads below what they had anticipated, while two others were above predictions—but so slightly as to be almost incalculable. Eastern systems showed greater margins under their December peak predictions than Midwestern systems, but again, several were so close as to have little significance.

Explanations Vary

Explanations for the lowered peak load—if it comes to pass—ranged from a possible slackening of business to the steady improvement in load factors throughout the industry. It was generally agreed that the kwhr output would be at or very close to the 282,000,000,000 figure stated by EEI in its year-end statement, or the 283,236,000,000 kwhr figure reported in NSRB's early December report.

Yet one expert predicted that the December peak, nationally, would be 1,500,000 kw below the NSRB peak prediction, which was set at 52,945,000 kw.

EEI expected to settle the matter within a week or two, as a result of a questionnaire it has sent to its members. Meanwhile, speculation was rife—and most of it was optimistic. ELECTRICAL WORLD's survey was too small, and the figures too hastily assembled, to permit its percentage result to be considered valid. Imprecisely, though, it showed that systems with an anticipated peak demand of 19,715,000 kw were 2.21% under their pre-Christmas predicted December peaks.

One contributor to these totals said:

"The weather was wonderful. If we hadn't had all the weather breaks, we could have been as far over as we were under."

Another said:

"The amount by which we were under our predicted peak isn't anything statistically, but it amounts to one machine on the system, and that can be a lot when you're up to the roof."

In some quarters, experts pointed to the slackening rate of growth of the weekly kwhr output over last year's production as the indicator. Commercial consumption, particularly, showed a declining rate of growth from July through October. In July, commercial consumption reached a weekly peak 17% ahead of the comparable week in 1947. By October, one weekly figure was down to 9.3% ahead of the comparable 1947 week, and the progression downward was steady. Industrial users went from an August week when their consumption was 10.9% ahead of the comparable week of 1947 to an October week when the rate of growth was only 8.8%. Residential rate of growth declined as well, but only slightly. And the expectation was that November figures would show declines continuing.

Whatever happens to the peak in 1948, the output throughout the year was startling. Thirteen times it set new weekly records. These came twice in January, once in August, and then 10 times in the 11 weeks preceding Christmas week. The sole defection was due to the Thanksgiving holiday.

To meet loads of this nature, the industry was throwing capacity into place furiously as the year ended. FPC showed that capacity in place Dec 1 totalled 55,706,926 kw. And according to public record, another 629,500 kw, as yet unrecorded by FPC, has begun operation during December, bringing the nameplate capacity in service up to 56,336,000 kw. At the close of 1947, the capacity was 52,211,488 kw. The average plant factor for the nation was thus very close to 60% for 1948.

ARKANSAS POWER & LIGHT CO's new Cecil Lynch Plant, near Little Rock, exemplifies the year 1948 in the electric power business. There, 60,000 kw in one unit is being added to the original 30,000 kw. Throughout the United States, other electric utilities were doing the same job all year long. The 1948 expansion is only a part of a continuing program which is to total 25,300,000 kw in the five years 1947-1951 inclusive. To enable the power industry to do this job—a 50% increase in capacity in five years—electrical manufacturers continued, through 1948, to build equipment as fast as possible. General Electric produced 65 steam turbines with an aggregate capacity of 2,932,000 kw. Westinghouse Electric shipped more than 2,000,000 kw of new steam turbine capacity. Both were records. Despite indications that the 1948 December peak load will be below that anticipated, no one was worrying about a slackening of turbine production for years to come

COMPLETION of second large addition to Cliffside Plant of Duke Power Co brought together for the celebration J. V. Santry, left, president of Combustion Engineering Co; Charles E. Wilson, president of General Electric Co; Norman Cocke, vice-president of Duke Power; and E. E. Williams, superintendent of Duke Power's Steam Department. The original plant consisted of two 40,000-kw units installed in 1940. Two 65,000-kw units have since been added

Westinghouse Joins Atom Program; Industry Advisory Group Reports

THE WESTINGHOUSE Electric Corp got into the postwar atomic energy picture this week (Dec 30). And at the same time, the Atomic Energy Commission's Industrial Advisory Committee, headed by Detroit Edison President James W. Parker, wound up its year of work with a report on ways for AEC to bring still more firms into the atom program.

Ever since General Electric Co began making itself a power in the atom business, people have been wondering when Westinghouse would get into the act. The company's answer has always been: When it could see a definite power application ahead. This week Westinghouse took on a contract to design and build an atomic power plant that would lead to an engine capable of driving a submarine.

Westinghouse's reactor, to be built somewhere near Pittsburgh, will differ considerably from the atomic power plant GE has started to build at the Knolls Laboratory outside Schenectady, N. Y.

GE's assignment, roughly, is to see how good a power plant can be built with techniques that are fairly well established: Temperatures comparable to those in modern steam plants, not much worry about weight, energy outputs per cu ft not greatly exceeding existing reactors.

Westinghouse will reach out somewhat farther into the unknown. It wants a compact unit suitable for shipboard. That means very high temperatures, perhaps 2,000F or better. And that, in turn, means it must investigate unfamiliar structural materials like titanium and zirconium.

Recruiting of Westinghouse and of DuPont Chemical Co, which this week drew the job of coordinating the chemical separation of plutonium products, adds significantly to the number of industrial firms involved in atom work. But the Industrial Advisory Committee isn't satisfied that having a lot of AEC contractors represents real industrial sharing in the atom job. Contractors, says IAC, "are selected by the government, and the extent of their role in the work is limited by specific assignment from the government."

IAC was formed back in October, 1947. The idea was that a group of industrialists would get security clearance, look over the whole AEC operation, and advise the Commission on where there was room for more industry participation and how the Commission could stimulate it. The members, in addition to Parker, were Bruce K. Brown, Gustav Egloff, Paul D. Foote, Isaac Harter, Jerome Hunsaker, Gabriel O. Wessenauer, Robert E. Wilson, and, originally, Donald F. Carpenter and Oliver E. Buckley. Walker L. Cisler, Detroit Edison vice-president, was its secretary.

The committee's report this week finds no startling new ways to bring industry into the atomic field. It says frankly that, except for radioisotope work, it knows of no immediately profitable fields. But it also says that if there are such fields or if profitable or promising prospects develop, there is today no way that industry could learn about them. "Businessmen neither know where to look nor what to look for."

To generate closer contact between AEC and industry, IAC recommends:

1. That AEC publish thorough technical round-ups of the non-secret data now buried in its files or scattered through the literature—reports on such things as the economics of atomic power, new metallurgical techniques, anti-corrosion processes, and the like.

2. The AEC publish fuller reports on its own procedures—patent and labor policies, contract administration.

3. That AEC arrange security clearance for technicians from industries like chemicals, oil, power, heat-transfer equipment—clearance that would permit them to visit AEC laboratories, talk freely to AEC people.

4. That AEC appoint a permanent industry advisory committee and make frequent use of temporary industry committees—as much to draw in businessmen as to get advice.

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FPC Denies Jurisdiction in Sho-Me Power Sales

The application of Sho-Me Power Corporation, Marshfield, Mo., for FPC authorization to sell part of its electric utility properties and facilities has been dismissed by the agency for lack of jurisdiction. The finding pointed out that part of the facilities involved are used for power transmission solely within Missouri, and the remainder are used in local distribution of the energy so transmitted.

Sho-Me Power's proposed sales include its Cuba, Mo., electric system to the city of Cuba; facilities in and around Puxico to the Ozark Border Electric Cooperative; and distribution systems in Advance, Bell City, Heagy, Messler, Pointon, Perkins, Randles, and Sturtivant to the Scott-New Madrid-Mississippi Electric Cooperative.

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Kentucky Facilities Sold

The Kentucky Public Service Commission has approved purchase by the Kentucky Utilities Co, Lexington, of facilities at Drakesboro in Muhlenberg County owned by Black Diamond Coal Mining Co. They serve about 300 customers. Purchase price was $5,000.

TITUS GENERATING STATION of Metropolitan Edison Co gets its start from President O. Titus. The $22,500,000, 225,000-kw station will be built along the Schuylkill River about 3 miles south of Reading, Pa. Others, left to right, are W. H. Doran, executive vice-president; H. M. Rankin, chief engineer; and A. J. Althouse, assistant to the president

Electric Industry Broke Records, Made Gains in '48, Acker Reports

THE ELECTRIC INDUSTRY in 1948 installed an unprecedented amount of new generating capacity, topped the record set in 1947 for the addition of new customers, and made substantial gains in electricity production over the peak attained in the previous year. This was the year-end announcement of Ernest R. Acker, president of the Edison Electric Institute.

More specifically, the president of Central Hudson Gas & Electric Corp asserted:

1. More than 4,000,000 kw of generating capacity were added to bring the nation's total to over 56,000,000 kw.

2. Output reached approximately 282 billion kwhr, with industrial and railway plants adding another 54 billion kwhr for their own use.

3. Over 2,000,000 new customers were added to top the 1947 mark by a slight margin. The number of customers now is about 40,800,000.

4. Electric service is now available to 97% of all dwellings in the United States, and 94% are connected.

5. About 87% of all farms have electric service available and 75% are connected.

6. Average residential consumption in 1948 rose to 1,550 kwhr. Average annual farm use has risen to 1,900 kwhr.

7. A downward trend in rates was reversed during 1948. In the first 11 months more than 60 business-managed companies and 115 governmental and municipal systems were granted rate increases.

8. Average revenue per kwhr of residential electricity reached a record low of 3.01¢ at the end of the year. Average revenue per kwhr for all classes of consumers rose to 1.79¢ from 1.77¢ in 1947.

9. Total sales of both business-managed and governmental electric systems rose about 10% to 240 billion kwhr.

10. Gross revenues of business-managed electric companies reached a new high of $3,870,000,000 in 1948, about 11% over 1947. Net income for dividends and expansion of business increased from $656,000,000 to $675,000,000.

11. Fuel showed the greatest increase of all expense items in 1948, about 31% over 1947.

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Utility to End Contract with Cleveland Transit

Cleveland Electric Illuminating Co notified the municipally owned Cleveland transit system Dec 22 that the present contract for electric power will be canceled as of June 22, 1949.

Increased costs were given as the primary cause of the cancellation. In its formal notice CEI cited reasons almost identical to those of the CTS last July when the latter increased its fares about 20%.

The present contract between the two is essentially the one entered into Jan. 1, 1933. The only adjustment of any note since that time has been an increase in rates under a fuel clause.

Neither CEI nor CTS, the latter wholly surprised by the former's taking advantage of a six-months' cancellation clause in the present contract, would make any comment or estimate on what the new rates would be, except for CEI's cryptic statement that they would need to be "substantially higher" than at present.

CTS's power bill in 1947 was $1,351,881. The 1948 bill will be approximately $1,333,000, the decrease largely resulting from substitution of buses on lines formerly served by trolley cars.

That CTS might speed up its plans for still further use of buses was seen in comment from CTS officials that a substantial increase in power rates could easily alter the present plans relative to purchasing of electrically or fuel-operated vehicles. At present the balance between the two is close because of a recent drop in gasoline prices.

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Maltbie Leaving PSC

Milo R. Maltbie, chairman of the New York Public Service Commission, has filed an application for retirement, effective Jan 22. The 77-year-old chairman, who has held the post since 1930, submitted his resignation to Gov Thomas E. Dewey, June 14, but was persuaded to remain until a successor could be found. It is expected that Spencer B. Eddy will be elevated to the chairmanship.

POTHEAD of new 138-kv underground cable of Detroit Edison Co attracts the attention of Lemore W. Clark, left, superintendent of underground lines; President James W. Parker; Harold W. Collins, superintendent of electrical system; Walker L. Cisler, executive vice-president; and William W. Williams, chief engineer of lines. The gas-filled line, which was energized last month, is 13 miles long and connects the Northeast and the Warren Stations

Heat Pump Progress Report Shows Earth Often not Good Heat Source

THE EARTH by itself in many areas does not look too promising from a practical standpoint as a heat source for the heat pump. This is brought out in a fifth heat pump progress report by Philip Sporn, president of American Gas & Electric Service Corp. The report is the first since May, 1947.

A number of tests have been conducted on three types of embedded surfaces to determine the heat transfer rate when the earth is being used as a heat sink and a heat source. These types consisted of 1. A 50-ft and two 40-ft tapered monotube piles buried vertically and having a total outside surface area of 382.2 sq ft, 2. a 30-ft long by 3-ft diameter tube bundle buried horizontally and having a total primary outside surface area of 106 sq ft, and 3. five 20-ft lengths of 2 in. IPS wrought iron pipe with a 1 in. IPS inside pipe buried vertically and having a total outside area of 62.5 sq ft.

Of the three surfaces tested it appears that the last offers the best practical application for use with a heat pump system.

Approximately 480 linear feet of 2 in. IPS and 480 linear feet of 1 in. IPS pipe would be required to permit the heat pump system to have a heating output of 45,000 Btu/hr. assuming:

1. A minimum ground temperature of 47F during the heating season.
2. A normal on-off operating cycle.
3. A 3.5 coefficient of performance.
4. A 20F refrigerant temperature in the embedded surface.
5. Soil characteristics similar to that experienced at Brilliant, Ohio.

The present-day cost of such an installation would be around $540.

Four manufacturers, in cooperation with the electric utility serving the area selected, are now installing or have installed pilot model heat pump air conditioning units for field testing.

General Engineering & Manufacturing Co, St. Louis, and the Webber Engineering Co, Indianapolis, plan to install several 5-hp units using the earth as a heat source and heat sink.

General Electric Co, Bloomfield, N. J., is installing a pilot model in each of seven different geographic areas in the eastern and southwestern parts of the United States, using air as the heat source.

Cooperating utilities in this program are Narragansett Electric Co, Providence, R. I.; Central Hudson Gas & Electric Corp, Poughkeepsie, N. Y.; Public Service Electric & Gas Co, Camden, N. J.; Potomac Edison Co, Hagerstown, Md.; Ohio Power Co, Canton; Alabama Power Co, Birmingham; and Central Power & Light Co, Corpus Christi, Tex.

The American Gas & Electric Co and subsidiary companies in cooperation with the York Corp, York, Pa., have installed five developmental pilot self-contained residential heat pump units. Each of the units will have a 2-hp and a 3-hp refrigerating compressor connected to separate refrigerant circuits. However, one conditioner fan and one outdoor fan are common to the two refrigerant circuits.

Outdoor air will be used as a heat source for Kingsport, Tenn.; Roanoke, Va.; and Conshocton, Ohio, units. Well water and outdoor air will be used for the Abingdon, Va., unit. Earth and outdoor air will be used for the South Bend, Ind., unit. In all five of the residential heat pump systems warm or cold air, as required, is supplied to the conditioned space by means of a forced air duct system. The systems are completely automatic to supply year-round controlled air conditioning, including heating or cooling, humidification or dehumidification, and filtering.

The heat pump water heater program has not advanced so rapidly as the heat pump air conditioner program. Several manufacturers have been making engineering studies and analyses to determine possibilities of the former and at least two manufacturers have assembled pilot models for laboratory tests.

American Gas & Electric Co and its subsidiaries have designed and tested two heat pump water heaters. The first of these employed an open type refrigerating compressor, and the other a hermetically sealed compressor. In the latter unit, it was found possible to heat successfully one third of a 75 gal tank to 153F and the remaining two thirds to 120F with an average coefficient of performance of 3.2 or better. (Details will be published shortly in ELECTRICAL WORLD).

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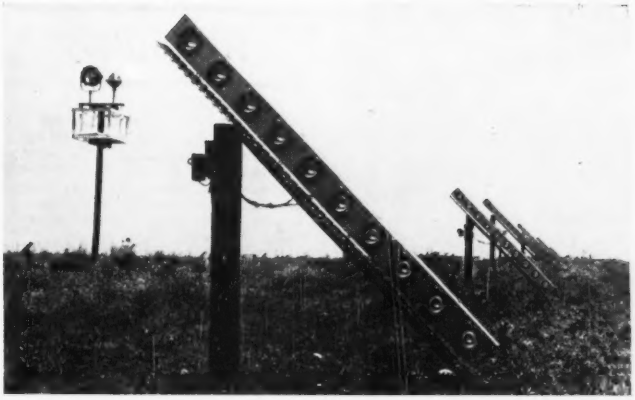
Cleveland Blackout Due to Reactors That Failed

The failure of two reactors caused the Cleveland blackout of Dec. 9 (EW, Dec 18, Page 75). Cleveland Electric Illuminating Co has announced that it will replace all 57 reactors of that type now in service.

Company engineers have completed their investigation of the trouble. They report that it started with a short circuit in an underground 11-kv, 3-phase cable connecting Switchhouse C of the Lake Shore Plant with a substation about two miles away. The short caused an excessive flow of power in the cable between the break and the switchhouse. There two of the reactors connected to the shorted cable failed to function, and a flash fire resulted, completely shutting off the output of power from the plant.



"SLOPE LINE LIGHTING," which the Civil Aeronautics Administration is ready to adopt for airport approaches, as it appeared installed at the CAA experimental station at Indianapolis. The lights are standard sealed-beam automobile headlights

Backers of MVA, CVA Plan Drive on Congress

A new drive for valley authorities is being shaped up in Washington. Backers of proposed authorities for the Columbia and Missouri River Basins will descend on the new Congress with new plans, new strategy, and new voting strength.

The new strategy and planning call for concerted drives to get early Congressional approval of TVA's proposed steam generating plant at New Johnsonville, Tenn., then authorizations for a CVA and MVA, in that order. Proponents of this project are counting on the votes of new members of Congress like Minnesota's Senator-elect Hubert Humphrey, an ardent MVA advocate, to carry them to victory.

The valley authority combination has arranged for its most elaborate national publicity setup to date. The Regional Committee for an MVA will send its chairman, Benton J. Stong,, to Washington to handle publicity and assist with legislative plans. A former newspaperman, Stong has long been active in the National Farmers Union, an organization backing MVA.

Sen James Murray, Montana Democrat, again will introduce an MVA authorization bill, while Representative-elect Hugh Mitchell of Washington will sponsor CVA legislation. Murray, at least, hopes to present the MVA measure with several co-sponsors—20 senators, he predicts. Among the sponsors will be Senator Humphrey, who already is helping to draft the MVA bill. Other support is expected from TVA supporters, like Senator-elect Estes Kefauver of Tennessee.

A feature of the new MVA legislation will be a provision assuring the continued activity of federal agencies already engaged in Missouri Basin development. Objective of this clause is to lessen the hostility of the Bureau of Reclamation, Army Engineers, and their potent grass-roots adherents. Such organizations as the National Reclamation Association and the Mississippi Valley Association, both of which have strong Congressional ties, have bitterly opposed MVA plans. There is no indication of a shift in their sentiment on the proposal.

Meanwhile, MVA backers have gained important new support. In addition to the Farmers Union, they have gained official endorsements from the American Federation of Labor, the Congress of Industrial Organizations, and the Brotherhood of Railroad Trainmen.

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Canadian Utility to Add 2 Units at Black River

Work is expected to begin soon on an $800,000 addition, with two 3,000-hp units, to the Pembroke Electric Light Co power plant on Black River near Waltham, Que. They are expected to be in operation in late 1950 or early 1951.

The company also is installing two additional diesel auxiliary units of 1,000 hp each at the Pembroke substation on the north side of the Ottawa River in Quebec. Scheduled for operation this winter, these two units are designed to enable the Black River plant to meet increased demand. Construction of a new substation and improvement of dam and water storage facilities also are planned.

Westinghouse Electric Reports '48 Record Year

To Westinghouse Electric Corp 1948 was a record year, Gwilym A. Price, president, said in a year-end statement.

In the first 11 months the corporation shipped $873,342,638 of electrical equipment and household appliances, 6.5% more than in all 1947. This was a new record for any similar period in Westinghouse history. New orders booked during the first 11 months of 1948 totaled $960,556,927, compared with $898,333,791 a year ago. Unfilled orders on Nov 30 totaled $696,206,505, compared with $685,340,339 at the end of 1947.

In 1948 the steam division shipped more than 2,000,000 kw of turbine capacity, 43% above last year's record figure and two and a half times the company's best prewar output. Present orders for power-generating steam turbines and associated equipment call for production during the next three years at annual average rates double those of the best prewar year. Deliveries in 1950, two years away, are expected to exceed this year's record high.

Appliance shipments were also high.

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South Carolina Power to Add 3rd Unit at Hagood

South Carolina Power Co's principal station, the Hagood plant near Charleston, will be expanded to include a third steam generating unit. Together with a generator now in operation and another to be installed by the summer of 1950, the new unit will give the plant a capacity of more than 75,000 kw.

Total cost of the three units will be about $12,300,000. Less than $3,000,000 of this has been spent to date. When completed the plant will have a capacity in excess of 100,000 kw and will be the largest steam plant in South Carolina.

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Indiana Group Names Anderson Vice-President

M. D. Anderson, vice-president of the Northern Indiana Public Service Co, Hammond, was elected vice-president of the Indiana Electric Association at a recent meeting of its directors.

A graduate of Purdue University, he has spent his entire business career with Northern Indiana. This election completes the roster of officers for the association. Earlier G. J. Oglebay, vice-president of the Public Service Co of Indiana, had been elected president and E. F. Hauser re-elected secretary.

American Subsidiaries in Brazil Get U. S. Loan

Twelve operating subsidiaries of American & Foreign Power Co have obtained an $8,278,000 Export-Import Bank credit to expand their facilities in Brazil. The credit will be used to purchase materials, equipment, and services in the United States.

The bank has accepted notes of the operating companies, unconditionally guaranteed by Brazilian Electric Power Co, subholding company of American & Foreign.

Efforts to obtain private financing of the operating companies' expansion program fell short of requirements, the Export-Import Bank's announcement said.

American & Foreign has invested $25 million in new facilities for the Brazilian companies during the past three years, it was reported. For projects to be completed in 1949, including installation of 61,220 kw of new generating capacity, $13,150,000 is required. Of this total, $4,872,000 will be supplied by the Brazilian companies and American & Foreign, with the bank credit covering the remainder.

The bank described the objective of the credit advance in the following terms:

"The operations of these companies have been a credit to United States and Brazilian private enterprise and should continue to be productive of good will as long as the companies provide adequate modern facilities and services. The ability of this system to finance needed improvements. . . . is, therefore, of great interest to the United States. It is believed that an American company which successfully fosters the cooperation of local capital and thereby makes a contribution to good international relations is entitled to suitable support by the Export-Import Bank."

Notes accepted by the bank will bear interest at 4½% and will mature in 20 semiannual installments beginning March 1, 1950.

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Kelly Back from 2 Years of Utility Work for OMG

Col. William Kelly, former president of the Buffalo Niagara Electric Corp, has returned to Buffalo after almost two years spent supervising rehabilitation of Germany's public utilities as chief of the Public Utilities Section, Industrial Branch, Office of Military Government.

Before the war, the colonel explained, Germany had a large number of small power plants, which the Nazis began uniting into a national system. "During the war," he said, "40% of the nation's power came from plants owned by industries. The public utility plants did not suffer as much from the war as did the industrial plants. The latter now would like to transfer their responsibility in supplying power to the public plants."

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Waymack Leaves AEC

William W. Waymack has resigned as a member of the United States Atomic Energy Commission for "compelling personal reasons." The departure of the former editor-in-chief of the *Des Moines* (Iowa) *Register and Tribune* marks the first break in the Commission's membership since its creation in 1946. Waymack said his initial plans called for a long rest.

MEETINGS

Southeastern Electric Exchange—Engineering & Operation Section, General Oglethorpe Hotel, Savannah, Ga., March 24-25; Annual Conference, Boca Raton Club, Boca Raton, Fla., April 13-15. John A. Talley, executive secretary, Haas-Howell Building, Atlanta, Ga.

PREVIOUSLY LISTED

Canadian Electrical Association—Winter Conference, Chateau Frontenac, Quebec, January 17-19.

Edison Electric Institute—Accident Prevention Committee, Book-Cadillac Hotel, Detroit, January 24-25; Transmission & Distribution Committee, Netherland Plaza Hotel, Cincinnati, February 10-11; Electrical Equipment Committee, New Jefferson Hotel, St. Louis, February 14-15; Annual Sales Conference, Edgewater Beach Hotel, Chicago, April 5-7; Engineering Committees, Edgewater Beach Hotel, Chicago, May 2-4; Annual Meeting, Traymore Hotel, Atlantic City, June 1-3.

American Institute of Electrical Engineers—Winter General Meeting, Statler Hotel, New York, January 31-February 4.

Missouri Valley Electric Association—Power Sales Conference, February 10-11; Sales & Rural Committee, February 25; Accounting Committee, March 7; Engineering Conference, April 6-8; Rural Roundtable, May 4; Sales & Rural Conference, May 5-6; Accounting Conference, May 12-13; Annual Meeting, May 17. All meetings at the Hotel President, Kansas City, Mo.

Pennsylvania Electric Association—Prime Movers Committee, Hotel Hershey, Hershey, February 10-11; Transmission & Distribution Committee, Benjamin Franklin Hotel, Philadelphia, February 24-25.

American Society for Testing Materials—Spring Meeting and Committee Week, Edgewater Beach Hotel, Chicago, February 28-March 4; Annual Meeting, Chalfonte-Haddon Hall Hotel, Atlantic City, June 27-July 1.

Institute of Radio Engineers—National Convention and Exhibition, Hotel Commodore and Grand Central Palace, New York, March 7-10.

National Electrical Manufacturers Association—Winter Convention, Edgewater Beach Hotel, Chicago, March 13-18.

Oklahoma Utilities Association—Annual Convention, Hotel Tulsa, Tulsa, March 17-18.

National Association of Corrosion Engineers—Annual Conference and Exhibition, Netherland Plaza Hotel, Cincinnati, April 11-14.

Midwest Power Conference—Sherman Hotel, Chicago, April 18-20.

SEC RULINGS

UNION ELECTRIC CO OF MISSOURI has been authorized to split its common stock on a 3½-for-one basis to permit it to file a consolidated tax return with the North American Co, parent. SEC emphasized, however, that nothing in its decision is intended or should be construed as sanctioning continued existence of North American Co as a holding company. Under Union Electric's proposed stock reclassification, North America's holdings would be increased from 2,795,000 to 9,782,500 shares and voting control from 87.94% to 96.23%. (Release No. 8687).

COMMONWEALTH & SOUTHERN CORP has been authorized to pay a dividend of $1.50 a share, aggregating $2,161,870 on outstanding preferred stock, payable Jan 3, 1949, to stockholders of record on Dec 10, 1948. (Release No. 8689).

NORTHERN STATES POWER CO OF MINNESOTA has been authorized to acquire from the McLeod Cooperative Power Association, a Minnesota corporation, certain utility assets, consisting principally of the existing electric distribution and street lighting systems in the village of New Auburn, Sibley County, together with all equipment of and appurtenances to each of the systems and all franchises, permits, contracts, leases, easements, and rights of way under which the property is held or operated. Excluded are McLeod's cash on hand or in banks, accounts receivable, customers' deposits and refundable advances, prepaid insurance, and certain specific items of physical property. The purchase price is $13,540, subject to certain adjustments. (Release No. 8693).

DELAWARE POWER & LIGHT CO, a registered holding company, and its public utility subsidiary, Eastern Shore Public Service Co of Virginia, have received approval of their joint application with respect to the following proposed transaction: Eastern Shore will issue and sell, from time to time, but not later than Dec 31, 1950, up to $400,000 principal amount of its 4% promissory notes due Oct 1, 1973, and 4,000 shares of its common stock of the par value of $100 per share. Delaware will purchase said securities at the principal amount or par value, respectively, and upon the purchase of any notes, Delaware will purchase common stock of an aggregate par value equal to the principal amount of such notes. Proceeds from the sale of notes and common stock are to be used to reimburse Eastern Shore's treasury for money previously expended for construction requirements, and to provide funds for future construction expenditures (Release No. 8701).

CONTINENTAL GAS & ELECTRIC CORP has received an extension to July 1, 1949, of the time limit within which it can issue 37,500 additional shares of its common stock to United Light & Railways Co, Chicago holding company. (Release No. 8720).

STANDARD GAS & ELECTRIC CO has won clearance on a proposal to declare a dividend on its prior preference $7 and $6 cumulative stock. No dividends have been paid on either series since 1934. (Release No. 8739).

Nevada Utility Installs Own Controls on Heaters

Sierra Pacific Power Co, serving western and northern Nevada, is installing company-operated controls on 1,600 of the 4,800 automatic water heaters in its system. The controls being installed before Jan 31 will be in Reno, Sparks, and nearby areas.

Permission for the installation was granted by the Public Service Commission some time ago when a reduced power rate for water heaters became effective. The reduced rate, which has already been put into effect, was made possible by the system of company-operated controls.

The Sierra Pacific rate for water heaters is now 1½¢ for the first 300 kwhr and 1¢ thereafter. Rates for other domestic uses average 2.68¢ throughout the system, but go as low as 2¢.

•

Puget Sound P&L Loses in Condemnation Action

A motion by the Puget Sound Power & Light Co to dismiss a condemnation action brought against its properties in Snohomish County, Wash., by the Snohomish County PUD has been overruled by District Judge Lloyd L. Black in federal court at Seattle.

The company contended a state law required PUD's to file condemnation actions in state courts, but Judge Black pointed out that the language of the state act granting PUD's the right to eminent domain in the same manner as incorporated cities and towns does not mention such a provision. Further, he said, an initiative enacted into law by ballot in 1930 mentioned that the PUD's could sue in any court of competent jurisdiction.

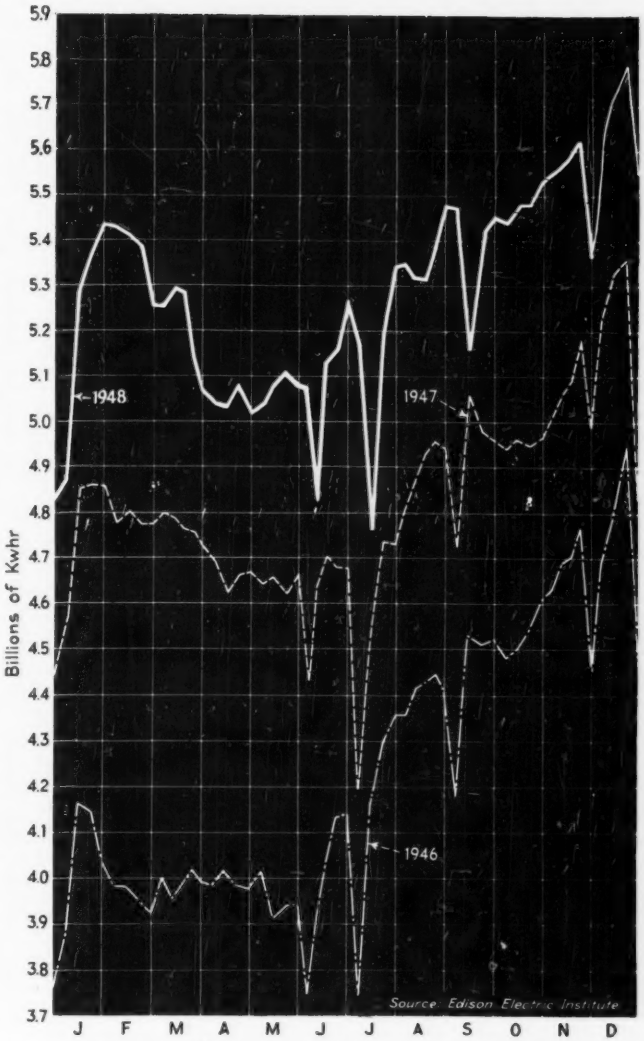
•

Utility Operating Revenues Rose 12.3% in October

Electric operating revenues of the larger privately-owned electric utilities in the United States in October, 1948, were $357,232,000, compared to $318,200,000 in October, 1947, an increase of 12.3%, according to figures released by the Federal Power Commission.

Revenue deductions (including operating expenses, depreciation, and taxes) were $292,702,000 or 12.9% over those of October, 1947.

Gross income, including other utility operating income, amounted to $68,321,000, an increase of 4.6% for the month. Net income was up 5.3% to $47,952,000 from the $45,528,000 reported for October 1947.



Output Falls Because of Christmas Holiday

For the last week of 1948, which ended Dec 25, output dropped to an estimated 5,550,000,000 kwhr, approximately 14.9% above that for the corresponding week of 1947. The sharp drop in output was due to the Christmas holiday.

The industry can look forward to the new year with confidence. Capacity reserves may not be what the industry would like them to be, but they are growing. The federal power commission reported that on Dec 1, total installed capacity was 55,706,926 kw. This was an increase of about 6.7% over Jan 1, 1948. The many units put on the line in December and yet unreported, would increase this to over 7%.

Weekly Output, Millions Kwhr

1948	1947	1946
Dec 25 5,550*	Dec 27 4,830	Dec 28 4,442
Dec 18 5,790	Dec 20 5,368	Dec 21 4,940
Dec 11 5,705	Dec 13 5,327	Dec 14 4,778

Percent Change from Previous Year

	Dec 25	Dec 18	Dec 11
New England		+ 2.3	+ 1.5
Mid-Atlantic		+ 4.9	+ 3.7
Central Industrial		+ 7.1	+ 6.3
West Central		+10.7	+ 9.0
Southern States		+ 7.9	+ 8.9
Rock Mountain		+15.7	+15.7
Pacific Coast		+12.0	+ 9.2
Total United States	+14.9*	+ 7.9	+ 7.1

*Estimated, subject to revision.

WASHINGTON COMMENT

WILLIAM B. WHICHARD

WASHINGTON'S "NEW LOOK"—from the political viewpoint, that is—promises few new problems for electric utilities during 1949. Rather, the New Year will give some new twists to long familiar problems. That's the net result of a check of the best available industry and government opinion.

The industry still will have to worry chiefly over maintaining good service in the face of soaring demand and continuing equipment shortages. New defense and foreign aid programs may well increase demand and add to shortages of such materials as conductor. Industry people must deal with the same federal regulators and competitors. And the more zealous bureaucrats will be harder to live with because they figure to have support from a majority of the new Congress. But even federal regulators are aware that more rate increases must be permitted.

Primary concerns of the government, both the legislative and executive branches, necessarily will be new national defense and international obligations. Whether Congress or the President wins the present dispute over the size of the military budget, defense requirements will take more steel, more aluminum, probably more electric energy out of our already tight economy. So will Lend-Lease for Western Europe and any other added assistance to the non-Communist world. That makes allocations and priorities for certain raw materials, at least, an almost certain bet for the near future. Utility equipment needs will be recognized, but rationing of power service, outside the Pacific Northwest, is a remote possibility.

At Administration insistence, Congressional revenue experts are looking for an additional $2 billion to cover new and expanded federal expenditures. They may eliminate some present taxes, like the energy excise. If they do, utilities and other business will more than make up the difference in added corporation taxes.

The public vs private power scrap won't be decided—this year or next. True, public power stands to win several important battles, but not the "war."

TVA probably will get the money it sought vainly last year for its new steam generating plant. But in authorizing the New Johnsonville plant, Congress won't approve, either directly or by inference, construction of federal steam plants anywhere and everywhere. It is even likely to give TVA a limited ticket—limited to so many kilowatts at New Johnsonville and nowhere else.

Congress will hear much and do little about more valley authorities. It won't accept an MVA—not so long as the Army Engineers, the Reclamation Bureau, and **private** industry keep busy in the Missouri Basin. CVA has more chance—about 50-50—because the present setup in the Pacific Northwest already is close to the authority concept. Ironically, neither a CVA nor any other human agency can bring the Northwest the relief from floods and power shortages it demands within a dozen or more years. It's an engineering and money problem, not one of political organization.

Congress will take preliminary steps toward putting REA into the telephone business, toward writing a new, tougher federal power policy, and toward chasing some lobbies out of Washington. It will take more than a year to accomplish any of the three.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Interlocks of all sorts are a natural concomitant of composite manual-automatic designs to effect simplified operation. Overall simplification often involves moderate complexity at some point.

Stainless steel is taking the place of metals less resistant to corrosion, erosion and cavitation. Hydro runner blading and guy wires are examples.

Magnetically-oriented silicon sheet steel is said now to be going into 70% of the transformers now being produced.

Distribution costs less and has higher firm capacity, in the conviction of some engineers, if substations and the units in them are relatively small.

Metal-clad switchgear for substations loses some of its simplicity if it must embrace an auxiliary bus.

Substation overloading has already occurred in 15 instances of the first 50 installed by a utility that has a two-year program covering 200 substations.

Peaks can increase several percent rather than be decreased by cutting off all water heaters at one time. Complete loss of diversity is given as the explanation.

Sectionalization for the purpose of resumption after a feeder outage might be accomplishable by having several different time-delay brackets for the reclosers.

Distribution system convergence toward fundamental, economical patterns has been impeded more by the incremental nature of its expansion than by any other single factor.

Relays could well be available in standardized bases and with standardized connections like watthour meters.

Microwaves Supplement Present Channels

Initial step in extensive radio system. . . . Microwave, with multiplexing, is planned for the backbone routes

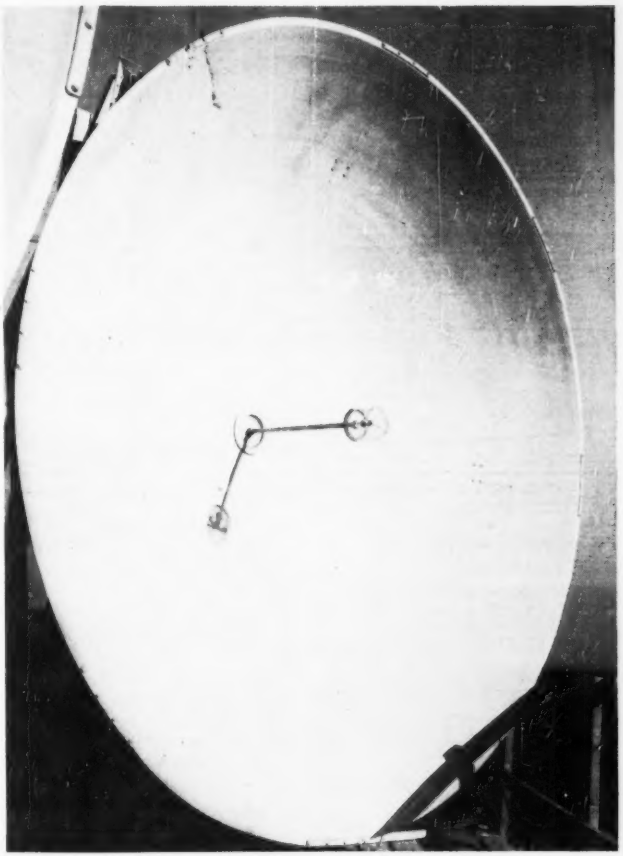
RICHARD F. STEVENS
Chief, Design Section
Bonneville Power Administration

DECISION to use a microwave radio relay link to supplement present intelligence channels of the Bonneville Power Administration has attracted considerable interest in the industry. Recent purchase by Bonneville of microwave equipment for a 200-mile section will constitute the first installation of its size and scope by a power utility. However, it represents only the first step in an extensive radio system which is expected ultimately to form the backbone of the communications system of the Administration.

Bonneville, like other utilities, has been faced with an ever-growing need for voice and other intelligence channels for load dispatching, system operation, maintenance, telemetering, power line relaying, supervisory control, teletype and facsimile, generator load control, and automatic fault locating devices.

The growth of the Bonneville system has been tremendously rapid. In 1938 transmission facilities consisted of only a few miles of 13-kv line. Today the system has become one of the nation's most important transmission networks. For various reasons, including, at different times, lack of money, lack of manpower, and lack of materials, the development of the communications system has lagged behind the growth of the power facilities. Further proposed expansion of these facilities, to handle the output of many more projected dams on the Columbia and its tributaries, has made it apparent that immediate steps must be taken to provide more adequately for present and future communication needs.

Unlike many older utilities, the Administration does not possess any extensive system of open wire phone lines. Therefore, the Administration has largely been free to plan its communication system from the ground up, using whatever type of channel is best adapted for each part of the system.



ANTENNA ASSEMBLY with 10-ft. diam reflector (experimental model)

In studying BPA needs, it was soon found that no one of the available types of channel is superior under all circumstances. On the contrary, it was found that each has some job which it can do best in a well-designed system.

1. "Microwave" (space radio oper-

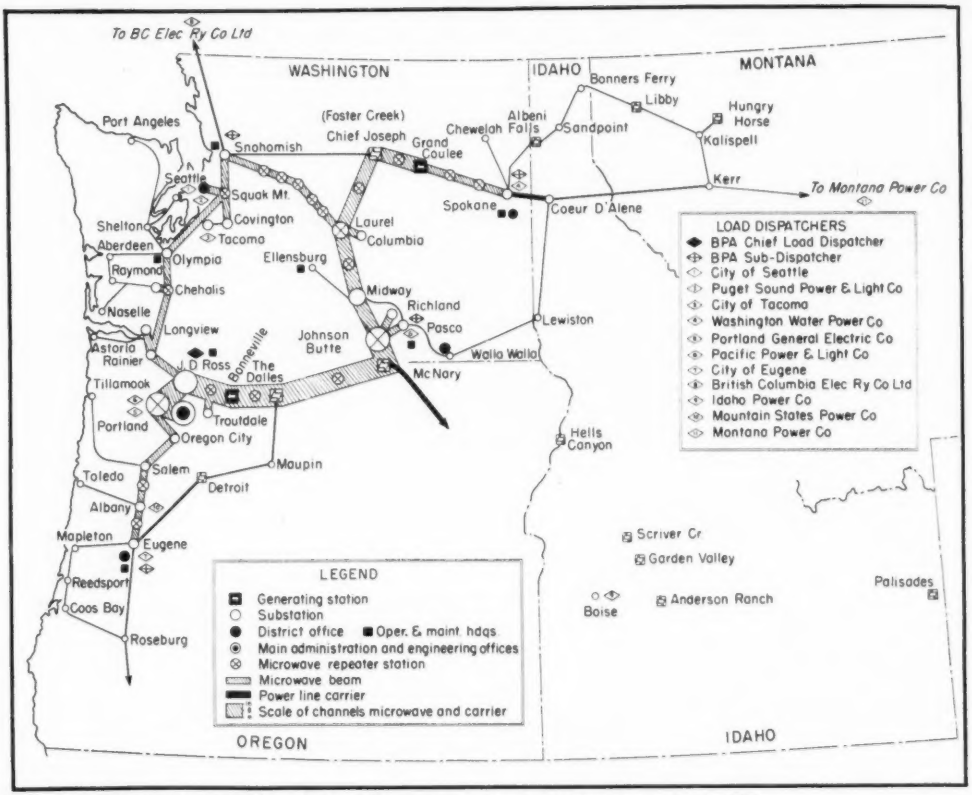


FIG 1—PROPOSED BPA SYSTEM as of about 1954. First portion is scheduled for operation in late 1949

ating in the "ultra high frequency" or "super high frequency" bands), with multiplexing equipment, is planned for the backbone routes where a large number of channels will be required. As shown in Fig 2, the first cost is higher than for a *single* power line carrier current channel, but the incremental cost for the additional channels is very small. Perhaps even more compelling than the cost argument is the rapidity with which the frequency spectrum suitable for power line carrier is being exhausted. Reliability of microwave radio can be made very high. Published data on an east coast installation operated by a commercial telegraph company showed reliability nine times as good as for wire lines.

2. Power line carrier is planned for communication over routes where the number of channels is small (three or less), especially where the distance between terminals is great. To some extent, it is expected that such needs will be supplied by existing carrier which may be displaced by microwave on "backbone" routes. The experience of BPA and other operating companies has shown carrier to be more reliable than leased wire, and cheaper in annual cost, except for very short distances. However, further development of radio equipment similar to that provided for "studio links" may make radio competitive with power line carrier for some of these installations.

3. Government-owned wire lines are presently limited to two lines in southwestern Washington (one of them acquired incidental to the purchase of a 33-kv transmission line), and short connections, generally buried cable, between substations and nearby BPA fixed radio stations. Except for the latter application, and possibly for some supervisory control applications, no new government owned wire lines are planned. In general, the cost is too high and the reliability too low.

4. Many short sections of leased wire service are planned for extensions from the main communication network to BPA offices, and offices of other utilities of the Northwest Power Pool. Leased wire will also be used for short supervisory control channels where the reliability is considered adequate.

5. Radio, in addition to use of a microwave backbone, will continue to be used for communication with mobile and portable sets, but on a larger scale than in the past.

Complete reliable coverage of the area is not possible from the present fixed stations, and others will be needed. Many of the proposed microwave radio sites are ideally situated for area coverage on fixed-to-mobile service, in combination, probably, with the main microwave network.

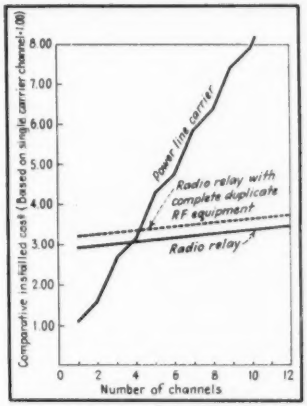


FIG 2—APPROXIMATE cost comparison, power line carrier vs radio relay, for average conditions on BPA system. Costs vary widely with channel length, type of terrain, etc. Accurate comparison requires detailed study of local conditions. Relative economy of microwave expected to improve with increased production

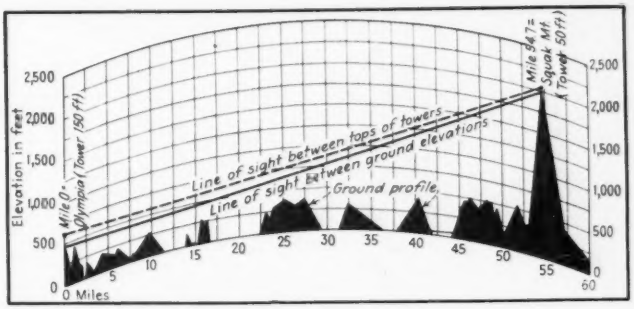


FIG 3—TYPICAL radio beam profile

6. Use of telephone company toll service will continue as the system expands. There will always be need of communication with offices and individuals who cannot be reached over the carrier-microwave network. There will be numerous additional small substations whose importance does not justify a carrier or radio set, but which will have a telephone company phone installed.

Proposed Communication System

Fig 1 shows the projected communication network, as of about 1954, with the microwave backbone and radial power line carrier channels.

The bulk of the communication traffic is and will continue to be between the main offices (including the dispatcher's office) in the Portland-Vancouver area, and the power houses, substations, branch offices, and dispatching offices of interconnected utilities.

This results in well defined traffic arteries as follows:

Portland-Vancouver north to the Seattle-Snohomish area.

Portland-Vancouver south to Eugene.

Portland-Vancouver east and north to Spokane via the various plants along the Columbia River

Within six years, we visualize that as many as 12 separate channels will be required to the north, 8 to the south, and 20 to the northeast.

Conditions thus are favorable to the application of a radio relay system. Such a system is being developed, step by step, as funds are available.

First Installation

The first equipment to be installed will connect the load dispatching and other offices in the Portland-Vancouver area with Covington Substation (20 miles southeast of Seattle), the new Snohomish station (25 miles north of Seattle), and the Olympia Substation (near Olympia, Wash.). A branch to Seattle will provide communication to the BPA district office there, and to the load dispatchers of the Puget Sound Power & Light Co and City of Seattle municipal system.

The radio transmitter and receiver at Covington Substation will be placed on the roof of one of the substation buildings from which there is a clear line of sight to Squak Mountain, twelve miles away, which will serve as a relay point. (The summit of this mountain, 1980 ft high, is to be shared with a police radio installation and a future broadcasting station.)

A 50-ft steel tower, of the standard forest fire lookout type, is planned for this point. From here a 29-mile clear line of sight will exist to a similar, but higher, tower to be erected in the vicinity of the Snohomish Substation (see Fig 3).

Squak Mountain will also serve as a relay point between Covington (or Snohomish) and Olympia, 55 miles away. It is also designed to provide for the branch to the City of Seattle and a possible future branch to the City of Tacoma.

The link from Olympia south to the dispatcher's office at J. D. Ross Substation, Vancouver, Wash., will involve two intermediate relay stations at Chehalis, Wash., and Rainer, Ore. A cable extension or radio link at Chehalis will ultimately connect with the major BPA 230-kv substation near that city, and a branch radio link from Rainier, Ore., will ultimately connect with the major 230-kv substation at Longview.

Reliability

The microwave system is designed to meet very exacting reliability requirements. The aim is to achieve 100% propagation reliability and to approach the same goal in equipment reliability.

The reason for this requirement is partly because of the large number of channels using the same radio carrier, and partly because of plans to use the microwave channels for power line protective relaying.

Using such channels, which are not affected by line faults, it is expected that it will be possible to decrease the time required to clear both ends of a faulted line. This fact, especially as it makes possible extremely fast reclosing, should increase materially the stable load limit of important lines.

In regard to propagation reliability, it will be noted that the receiver depends on the direct radiation from the transmitter over a line-of-sight path, and not on a reflected sky wave; consequently, it is not affected by changing conditions in the ionosphere. Under certain rare atmospheric conditions, mere line-of-sight may not be adequate, due to upward bending of the transmitted radiation. To provide against trouble on this

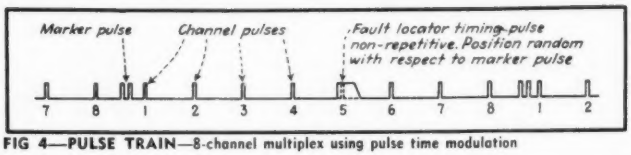


FIG 4—PULSE TRAIN—8-channel multiplex using pulse time modulation

score, the system has been designed to provide a minimum vertical clearance of 100 ft between the line-of-sight path from transmitter to receiver, and the terrain beneath. Other unusual conditions may result in signals travelling between transmitter and receiver by two or more paths of different lengths, such that the signals may arrive out of phase and give cancellation. This results in the so-called slow fading.

While it is not known whether such conditions will be encountered on this installation, diversity reception will be available to overcome them. Duplicate antennas will be mounted one above the other, separated so that cancellation can never occur simultaneously on both. Each antenna will be connected to its own receiver. The audio outputs of these two receivers will then be mixed.

Protection against equipment failure is gained in two ways. On radial links, transmitters will be provided in duplicate so that one will cut in automatically when the other fails. Duplicate receivers will also be provided whether conditions warrant diversity reception or not, in order to prevent interruption from RF equipment failure. At present, plans do not contemplate duplicate equipment for the separate audio channeling; however, more than one channel can be made available for critically important functions.

An alternate method proposed for part of the system is to provide alternate routes for traffic by means of a loop, instead of installing duplicate equipment in individual stations.

Careful provision has been made against failure of the primary power supply. Normally, an unattended relay station will be fed by a distribution line from the nearest power utility. Radio stations adjacent to attended BPA substations will be fed from the "clock bus" which is connected to the regular station service supply. In both cases a 125-v storage battery will be available. An inverter will be kept spinning with the d-c side normally connected to the battery.

Relays will be provided to cut over the radio equipment from the normal a-c source to the inverter in case of failure of the former. This cut-over will require about three or four cycles (of the 60-cycle voltage). Sufficiently large condensers will be provided in the power supply units of the radio equipment so that transmission will not be affected by a six-cycle interruption of the primary power source.

Small gas engine driven generators will be installed at unattended relay stations and at major power substations. These will start automatically in case of a prolonged a-c outage, to avoid excessive draw-down of the battery charge.

Selection of Sites

Selection of relay station sites was a very interesting problem.

The first step was to obtain a contour map for the general region between the two terminals of a radio link. These were made up by pasting together the necessary US Geological Survey quadrangle maps. By inspection of these, a number of alternate communication routes were plotted, taking advantage of high spots in the intermediate terrain for relay points.

For each of these routes, a profile was plotted, using a special graph paper which takes account of the curvature of the earth. Line-of-sight paths were plotted between terminals by way of the assumed intermediate relay points (see Fig 3).

The best path was then selected by a comparison of these profiles.

Many other factors besides topography entered into the selection of routes and station sites. Year-round accessibility was one of the most important of these. This ruled out most of the extremely high sites which might at first glance have seemed most desirable. Cost of providing a source of power was another important factor.

Intermediate radio station sites along the radio link were located near major power substations, wherever feasible, so as to provide communication services to them in addition to relaying the through communications traffic to points beyond.

Several designs and types of modulation are now commercially available for radio relay systems.

Federal Telecommunications Laboratories is supplying equipment for the first BPA installation and is using the so-called pulse time modulation, with an RF frequency in the 1700-1850 megacycle band. Eight high quality voice channels will be provided initially, but the equipment can be expanded to 16 or to 23 channels on the same RF carrier whenever traffic demands it.

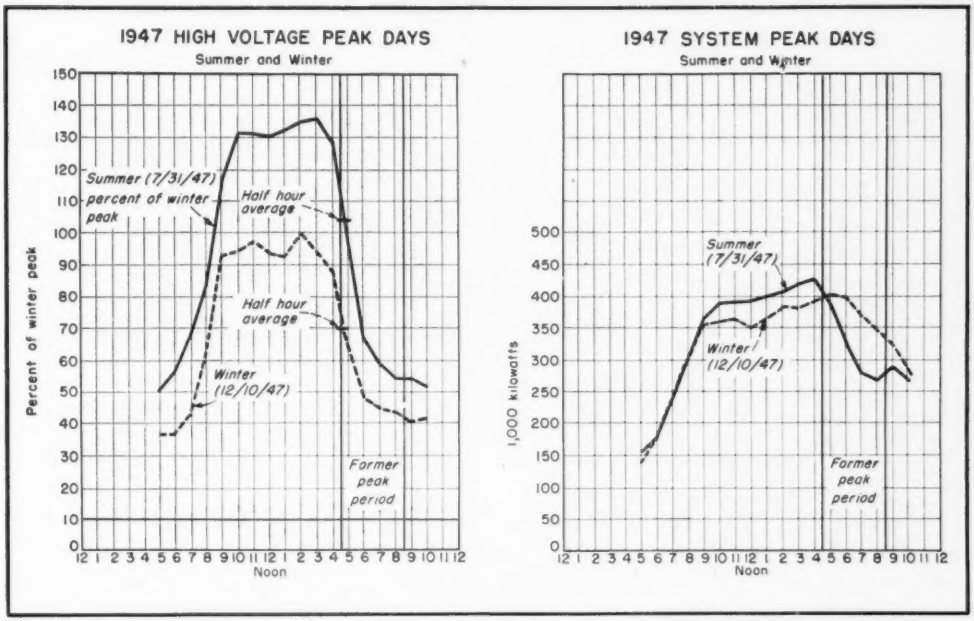
The equipment sends out "pulse trains" as illustrated in Fig 4, which are repeated approximately 8,000 times per second. These include the double synchronizing or reference pulse, plus one single pulse for each of the eight individual channels. Modulation is accomplished, in the case of each channel, by shifting the position of the corresponding pulse with reference to the synchronizing pulse.

Fault Locating Equipment

In addition to the above, the equipment provided for Bonneville will include a simple modification to permit transmittal of timing pulses for use with transmission line fault locating equipment. These pulses occur at random times with reference to the synchronizing and channel pulses, and are distinguished from these by their greater width.

The fault locator which will make use of these timing pulses is an original BPA development, and is described in a paper recently presented at the Spokane Convention of the AIEE*. It will include indicating and recording equipment to be installed in the dispatcher's office. This is expected to permit the dispatcher to read the location of a line fault occurring at any point on the 200 miles of line between Ross and Snohomish Substations, with much the same speed and accuracy with which voltage and kilowatts can now be read on station instruments.

* *A Transmission Line Fault Locator using Fault Generated Surges*, by R F Stevens and W T Stringfield.



RELATIONSHIP between 1947 System Peak and High Voltage Peak loads compared with peak period in old rate schedules. It is evident that the evening demands of high voltage customers is no measure of their system peak responsibility

Complexity To Simplicity In Rates Without Complaints

Electric rate increase along with simplification of schedules, elimination of obsolete features, better balance between rates and lower billing expense . . . A good selling job helped customer acceptance

H. F. G. MAIN
Research Department
Potomac Electric Power Co

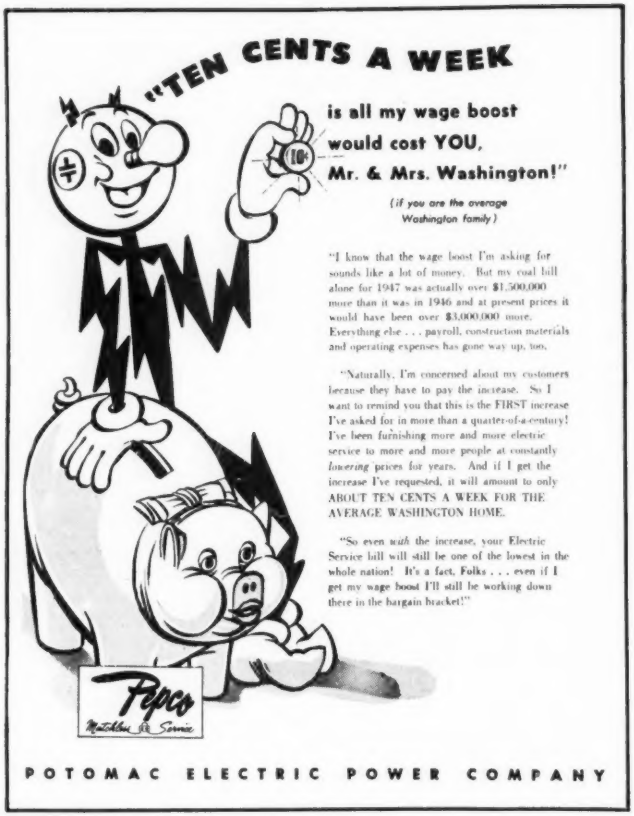
WHILE PROGRESS in an atomic age goes on making life more complex every year, electric rates in Washington have put on the brakes and gone into reverse. A multiplicity of complex schedules has been replaced by a minimum number of simple schedules producing two and three-quarter million dollars of additional revenue with almost no customer complaint.

Potomac Electric Power Co's 16 rate schedules, 5 residential and 11 commercial, have recently been replaced by 3 residential and 6 commercial schedules for its entire territory.

The previous rates, like a good many others, had a fair amount of "history" in their make-up. Annual rate changes to produce precise revenue reductions under a sliding scale arrangement; a policy of making rate reductions without raising any individual customer's bill; and the endeavor to provide for unusual special customer load conditions—these factors were largely responsible for the schedules having most of the features known to rate making.

The territory, which had developed into 2-rate-zone character, was still being served by 3-zone rates for residential and low voltage commercial customers and one high voltage rate.

The residential rates in all three zones had a 1.5¢ trailing rate which was generally too low, particularly for farm customers and air conditioning customers in outlying areas, and too high for uncontrolled water


"TEN CENTS A WEEK
is all my wage boost
would cost YOU,
Mr. & Mrs. Washington!"
(if you are the average
Washington family)
"I know that the wage boost I'm asking for sounds like a lot of money. But my coal bill alone for 1947 was actually over $1,500,000 more than it was in 1946 and at present prices it would have been over $3,000,000 more. Everything else . . . payroll, construction materials and operating expenses has gone way up, too.
"Naturally, I'm concerned about my customers because they have to pay the increase. So I want to remind you that this is the FIRST increase I've asked for in more than a quarter-of-a-century! I've been furnishing more and more electric service to more and more people at constantly lowering prices for years. And if I get the increase I've requested, it will amount to only ABOUT TEN CENTS A WEEK FOR THE AVERAGE WASHINGTON HOME.
"So even with the increase, your Electric Service bill will still be one of the lowest in the whole nation! It's a fact, Folks . . . even if I get my wage boost I'll still be working down there in the bargain bracket!"
Pepco
Watchless 24 Service
POTOMAC ELECTRIC POWER COMPANY

ADVERTISEMENT used to feature the "ten cents a week" average residential increase requested. Lowered to 7.4¢ by the rates finally approved

heater customers in the urban areas.

Separate residential schedules restricted to uses other than lighting, and commercial schedules for heating and cooking, had remained unchanged for a number of years and thereby created inequities between customers.

The general-use low voltage commercial schedules, used by all but low load factor customers over 10 Kw, were complicated and double-barreled—block meter form for low consumptions combined with 2-part demand and energy charges for higher use.

The winter peak period billing with its two-thirds ratchet was originally designed to put a premium on system peak use. A shift of the system peak from winter to summer had created inequities between commercial customers, particularly between summer peak air conditioning customers, winter peak customers, and those having annual demand factors over the group average of 80%. The unpopular "ratchet" feature had obviously produced little additional revenue.

A load factor discount rate without a fuel clause was giving service to two industrial type customers at less than present cost; fuel clauses were confined to a few special contracts amounting to only 20% of the total kw-hr sales. Also, the relationship between rate schedules had been seriously disturbed by the rising cost of fuel.

Prolonged litigation, over the reduction in return to 5.5% on a net rate base, together with other equally drastic changes in the sliding scale arrangement, had prevented earlier revision of the rate structure.

Last year PEPCO began a study of its rate structure on the basis of then present revenues, so that an anticipated general rate increase and the results of an overhaul could be accomplished at one hearing.

Fuel being a large component of cost of service to large commercial business, the rapid increase in its price was steadily distorting the relationship between the schedules. In other words, rates were getting farther and farther out of line with costs. The allocation of a revenue increase in proportion to kilowatt-hours generated for each business class would tend to restore the relationship.

Trailing Rates

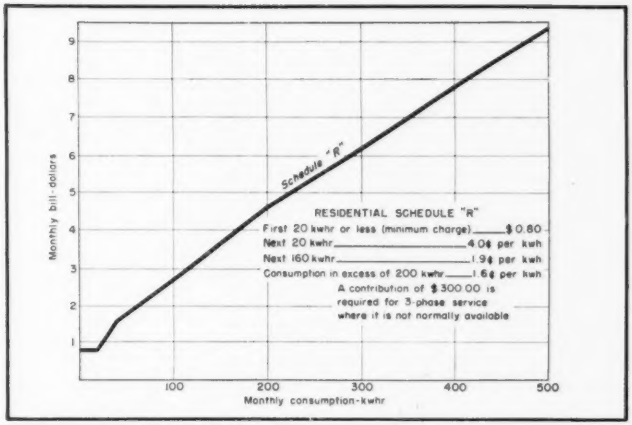
It was reasonable to expect that the residential trailing rate should be high enough to cover demand and energy costs for the use of low load factor appliances, such as air conditioning units, ranges, television sets and all kinds of electrical farm equipment. The former 1.5¢ rate was increased to 1.6¢ for use over 200 kw, and it is considered to be an absolute minimum.

The rates for high voltage service had not been materially changed for a number of years. Revenue from 0.5¢ trailing energy rates without a fuel clause was below production cost. A load factor discount in one rate reduced energy charges to 0.32¢ at 60% load factor. With production cost at the plant about 0.55¢, a trailing rate of 0.65¢ was about as low as could be reasonably charged for high voltage service.

10-Kwhr Unit Billing

It was found that substantial savings in billing expense could be made if residential and small commercial customers were billed to the nearest ten kwhr instead of in units of two kwhr. The only problem arose from small customers with consumptions between 20 and 30 kwhr a month, who might experience fluctuations of from $0.80 to $1.20 in their bills instead of the smoother 4¢ per kwhr. Studies disclosed that in most cases seasonal variations are wide enough to preclude any appreciable number of complaints from this feature. It only remained to set the residential and small commercial rate blocks in multiples of ten kwhr and provide for meter reading and billing to the nearest ten kwhr.

Estimates showed that the investment in transformers, service and metering equipment for a 5-hp 3-phase motor load in addition to other home appliances, fed from the overhead system, would be some $450 over the investment required for single-phase service. The additional investment for two such customers was estimated to be about $600. Since all normal size residential electrical appliances, including air conditioning systems and heat pumps, can operate successfully on single-phase service, it was evident that a contribution should be made by the residential customer who insists upon 3-phase service. It was therefore decided to require a $300 contribution when 3-phase service is demanded for residential use where it is not normally available.


Monthly bill-dollars
Monthly consumption-kwhr
Schedule "R"
RESIDENTIAL SCHEDULE "R"
First 20 kwhr or less (minimum charge) ____ $0.80
Next 20 kwhr ____ 4.0¢ per kwh
Next 160 kwhr ____ 1.9¢ per kwh
Consumption in excess of 200 kwhr ____ 1.6¢ per kwh
A contribution of $300.00 is required for 3-phase service where it is not normally available

RATES and monthly charges for residential service in Washington, D. C.

Residential Water Heating

PEPCO considered that energy for uncontrolled residential water heating could be furnished for 0.5¢ per kwhr. less than the proposed residential rate. If charged for under a separate schedule however, the cost of metering and billing would tend to wipe out the saving. Therefore, a residential water heating rate, consisting of a discount of 0.5¢ per kwhr below the standard rate for consumptions between 250 and 550 kwhr, was proposed for customers with approved heaters of 50 gal or more of tank capacity. (The Public Utilities Commission did not approve this proposal, pointing out that the full discount would not be available to water heater customers whose other consumption was less than 250 kwhr, or to customers who did not have both range and water heater.) The rate of 1.6¢ per kwhr for water heating will no doubt curtail a very desirable load, the expansion of which had been so rapid since the end of the war.

Low Voltage Commercial Rates

Two optional (with the customer) rates were proposed for low voltage commercial customers—a block meter schedule so that small customers and large, low load factor customers could be billed on an energy basis; and a 2-part schedule so that large customers and small high load factor customers could be billed on both demand and energy.

The block meter rate, without the expense of demand metering, was considered to be satisfactory for some 90% of the low voltage commercial customers having demands of ten kws or less. About one-third of these are rooming houses; the remainder are stores, small service establishments, apartment service lighting, etc.

The low consumption blocks in the "small" commercial schedule "SC" were maintained to conform as nearly to the residential schedule as was possible, consistent with the diversities between customers. The blocks were in multiples of ten kwhr, for meter reading and billing to the nearest ten kwhr.

The "large" commercial rate "LC" comprised only a 3-block demand charge and a 3-block energy charge with a fuel clause.

Because large commercial business included both summer and winter peak customers, it was inevitable that the range of percentage increases to individual customers would be wide. To reduce the range as much as possible, an additional energy block was added to the two which might otherwise have been considered adequate.

The demand charges are applied to monthly maximum demands irrespective of time of day or year, without protective "ratchet" or off-peak features.

Studies of the effect of a protective "ratchet" disclosed that annual demand factors averaged around 80%. The additional revenue that would be collected from a "ratchet" would not be enough to warrant the retention of an unpopular feature. Unforeseen new load conditions are covered by a clause in the General Terms whereby standard rates are not necessarily applicable to unusual types of load.

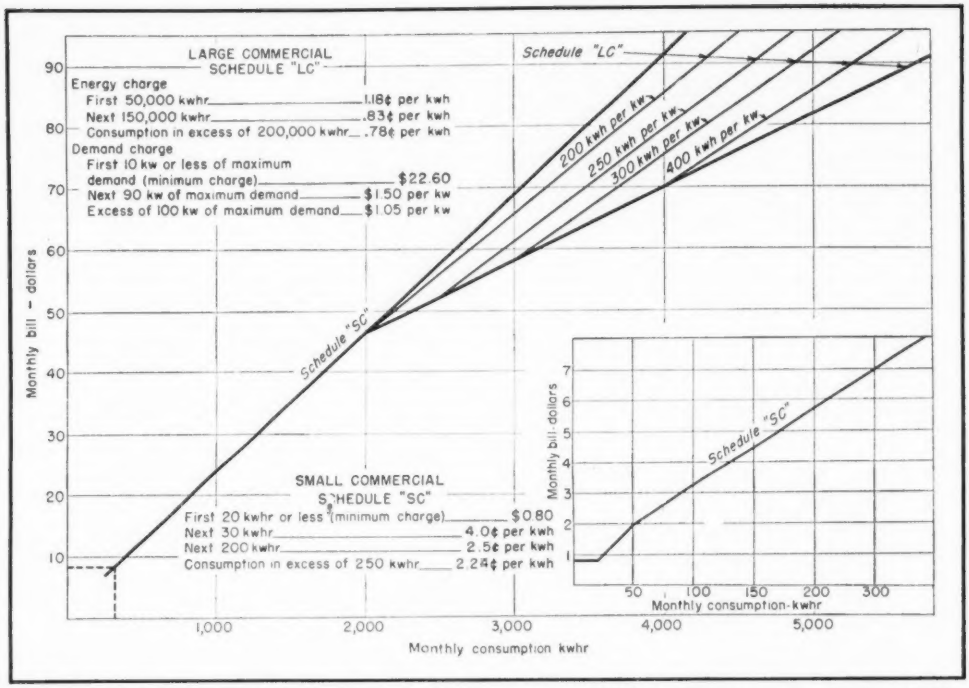
A reduction was made in the discount for primary service from 10% to 5%, based upon estimates of present costs. It might also be noted that the majority of companies allow 5% below the low voltage rate for such service. A fuel clause was added to prevent rising fuel costs from seriously disturbing the relationship between the rates.

High Voltage Commercial Rate

The form of the high voltage rate was made similar to the "LC" low voltage rate except for the demand charge, which was made in two blocks instead of three. The rate represents a reduction below the charge for low voltage service of from 17% for large bills to 24% for small bills, and is generally consistent with the estimated difference in the cost of service to the two classes.

Since the new rates result in charges to high load factor customers as low as costs would justify, the former load factor discount schedule was discontinued.

The kwhr allocation of an overall 12.0% increase gave the residential business an 8.7% increase, the small commercial 10.9%, and the large commercial 11.9%. The high voltage business, which had been getting the most benefit from the obsolete off-peak feature, as well as the lack of a


LARGE COMMERCIAL
SCHEDULE "LC"
Energy charge
First 50,000 kwhr 1.18¢ per kwh
Next 150,000 kwhr .83¢ per kwh
Consumption in excess of 200,000 kwhr .78¢ per kwh
Demand charge
First 10 kw or less of maximum demand (minimum charge) $22.60
Next 90 kw of maximum demand $1.50 per kw
Excess of 100 kw of maximum demand $1.05 per kw
Schedule "LC"
200 kwh per kw
250 kwh per kw
300 kwh per kw
400 kwh per kw
Schedule "SC"
SMALL COMMERCIAL
SCHEDULE "SC"
First 20 kwhr or less (minimum charge) $0.80
Next 30 kwhr 4.0¢ per kwh
Next 200 kwhr 2.5¢ per kwh
Consumption in excess of 250 kwhr 2.24¢ per kwh
Monthly bill - dollars
Monthly consumption kwhr
Monthly bill: dollars
Monthly consumption-kwhr

RATES for Low Voltage Commercial Service in Washington, D. C., show how load factor governs demand and non-demand rate features above 2,000 kwhr. The customer may select best schedule when consumption exceeds 2,000 kwhr between "SC" and "LC"

fuel clause, was necessarily allocated an increase of 21.9%.

The changes in the form of rates naturally produced variations from the class average in individual bills. The range of increase in residential bills varied from 2 to 13%, small commercial bills from 5 to 12% and large commercial bills from 5 to 27%. High voltage commercial bills varied between a slight decrease and a 30% increase. The range of bills over a 12-month period will narrow the spread of the annual increase to individual customers.

Throughout the preparation of the material upon which the conclusions were based, various phases were discussed with the staffs of the Maryland and District of Columbia Commissions involved and with representatives of the United States Government, the largest customer load group on the system.

The revised rate schedules, percentages of increases, and what the increases would mean in their specific application to various types and groups of customers, as well as the detailed wording of the revised general provisions for service, were also discussed with staffs of these bodies. These discussions were particularly helpful in minimizing differences; also the time spent in the formal hearing.

In the development of the exhibits and testimony for use in introducing the new rates at a public hearing, every effort was made to cover all the reasoning and at the same time present it in layman's language for the benefit of the public.

Former Schedule "L"		
Energy charge:		
First 50,000 kwh @		.95¢
Next 140,000 kwh @		.60¢
Over 190,000 kwh @		.50¢
Demand charge: (peak period)		
First	100 kw @	$1.30
Over	100 kw @	$0.90
Minimum charge (off-peak) for demands 3,800 kw and less:		
First	100 kw @	$0.75
Over	100 kw @	$0.60
Minimum charge (off-peak) for demands over 3,800 kw: $0.75 per kw and .5¢ per kwh		

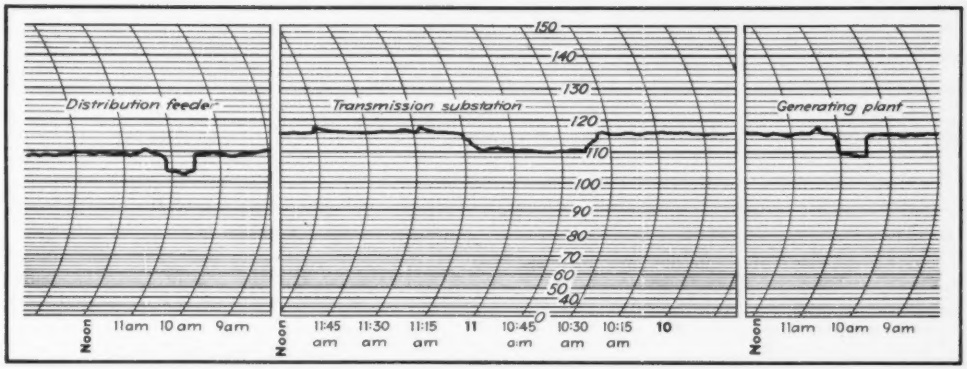
New Schedule "HV"		
Energy charge:		
First 50,000 kwh @		.89¢
Next 150,000 kwh @		.68¢
Over 200,000 kwh @		.65¢
Demand charge:		
First	100 kw	$120.00
Over	100 kw @	$0.90

COMPARISON of the High Voltage Commercial Schedules in the District of Columbia. Ratchet and peak period provisions are not shown in the former rates above Schedule "L"

Selling Their Public

Several months prior to filing its application, the Company had notified the Commission of the impending need for additional revenue and this notice was publicized by the press. When the application was filed, a press conference was held in the Municipal Building so that the Management's release went into the hands

(*Continued on page 102*)



RELATIVE VOLTAGE CHANGES on a typical distribution feeder (left), at a transmission substation (center) and generating plant (right) are shown before, during and after a period of system voltage reduction. Center chart shows quality of voltage regulation

Rheostat Scheme Retains Regulation During System Voltage Reduction

MANY ELECTRIC UTILITIES are resorting to system voltage reduction this winter, as a means of load reduction during periods of system peak and inadequate capacity. In adopting this practice, Cleveland Electric Illuminating Co has introduced a refinement that not only makes it possible to put a given voltage reduction into effect throughout the system in 90 sec, but also to maintain the established regulation band throughout the period of the reduction.

The refinement is simply a rheostat in parallel with the series resistance contact-making voltmeter circuit of voltage regulators of generators, tap-changing-underload transformers and distribution feeders. Each rheostat is calibrated to reduce the normal system voltage by a predetermined amount. When the rheostats are installed, the contact-making voltmeters will be adjusted to hold normal voltage at maximum resistance. As resistance is cut out of the circuit, in steps, voltage appearing across the contact-making voltmeter coil is increased causing it to act through the regulator to cut voltage the same amount.

JOHN R. LINDERS
Electrical Engineering Dept
and
PHILLIP W. RUSSEL
Electrical Dept
Cleveland Electric Illuminating Co
Cleveland, Ohio

Advantages of this scheme are these:

1. Automatic voltage regulators remain in operation throughout the period of voltage reduction. With automatic regulation the possibility of unduly low voltage is minimized. This permits a greater voltage reduction with the same customer tolerance than that obtained when regulators are cut out of service.

2. System procedures involved in reducing voltage are simplified. Voltage reduction procedures at distribution and subtransmission substations and generating stations do not have to be performed in any particular sequence, as would be the case if automatic regulation was discontinued and system voltage controlled manually at generating stations. Upon being notified that voltage reduction is required, the operators merely step to the regulator positions and turn rheostats to the percent voltage reduction requested by the dispatcher.

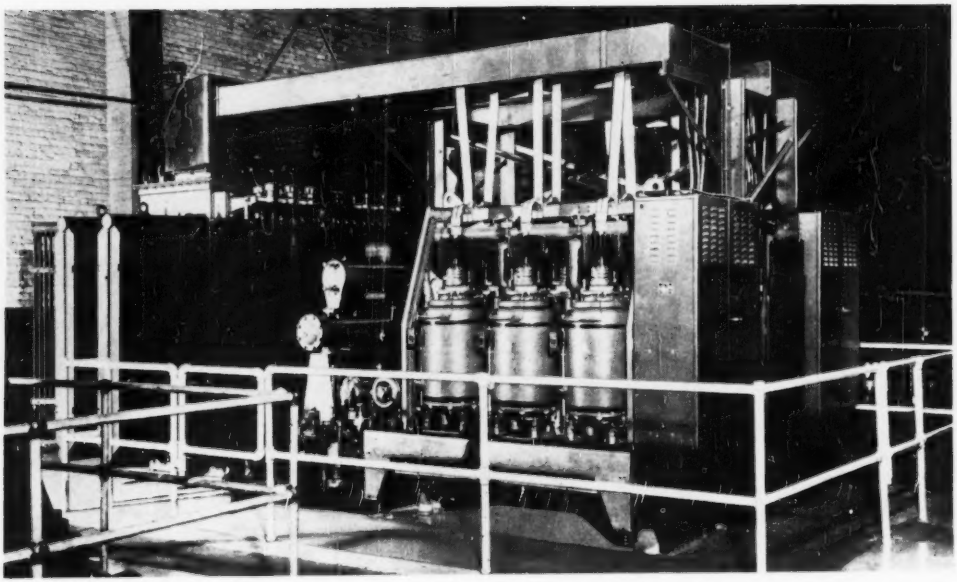
3. This scheme allows reduction of voltage at any substation or group of substations to secure load control in a limited area without affecting the entire system.

4. Operators are relieved of the burdensome job of calculating what voltage is to be maintained on a given feeder and adjusting it manually at intervals during the load reduction period. In stations with a large number of feeders this task can be an arduous one.

5. Cost of the scheme is minor. Average installation cost on the Cleveland system was $2.15 per regulator.

Calibrating adjustments of the voltage regulating relays proper are not disturbed when system voltage is reduced. This assures that each such relay will be returned to its previous voltage level when the need for reduced system voltage has passed.

Rheostats were installed on nearly 600 regulators associated with various equipments ranging from lighting feeders to generators. Rheostats of 4-w, 60-ohm rating were used with feeder regulators, while 25-w, 50-ohm rheostats were used for other applications.



MERCURY ARC RECTIFIER supplying 1,000 kw of d-c power to rail mill of Gary Steel Works has high operating efficiency

Power Rectifiers for Steel Mills Have Excellent Operating Record

Mercury-arc rectifiers for supplying power to auxiliary drives, and electronic-frequency changers for interchanging 25 and 60 cycle power are steadily increasing in steel mills . . . High efficiency and low maintenance record are among major factors responsible for rapid growth

FRANK W. CRAMER
Electrical Engineer
Carnegie-Illinois Steel Corp

BECAUSE OF operating advantages and good service record, use of mercury-arc rectifiers to supply d-c power for auxiliary drives in our steel mills has increased rapidly during the past ten years. This fact and the other data that follows are based on a comprehensive paper presented before the recent meeting of Iron and Steel Engineers.

Mercury-arc rectifiers have practically superceded rotating-type a-c to d-c converters for d-c voltages above 200 v and in capacities above 200 kw; except for large main d-c drives where speed adjustments are beyond the range of the field control.

During the past 8 years, the Carnegie-Illinois Steel Corp has installed twenty units totalling 19,700 kw of 250-v d-c mercury-arc rectifiers. At the present time, two 1,000-kw, 250-v units and five 500-kw units are on order. In addition there are two installations of electronic frequency changers in operation. One is at Gary, Ind.; it was originally rated at 6,667 kw and is now being increased to two 8,000-kw units for a total of 16,000 kw. The second is a 20,000-kw installation at Edgar Thomson Works, Pittsburgh. When all new units are installed, the total rectifier capacity will be 96,200 kw.

The units are all of the single anode type. Also, with the exception of the 20,000-kw electronic frequency changer, a small 200-kw unit, and the five 500-kw units on order, they are of the pumped type. Recently, based on studies of d-c load concentrations in two relatively small plants, it was decided to use 500-kw units at d-c load centers. These will be sealed-

tube rectifiers and be located for a minimum of copper for feeder lines.

In planning industrial installations several characteristics of rectifiers should be kept in mind. For instance, a rectifier will not in itself handle regenerative power. If they supply d-c power to cranes, or any over-hauling load, a dynamic braking panel must be added. Also, rectifiers do not correct power factor. The power factor of the unit with regulated voltage is from 91 to 94% lagging.

Rectifiers have a higher efficiency than rotating units. For 300 to 500-kw rectifiers, the better efficiency nets about 15 kw per hour of operation.

The operating records of the rectifiers have been good. If the starting-up periods are omitted, there are few operating difficulties. For eight years, units have functioned as unattended transformer sub-stations with only routine inspections and repairs.

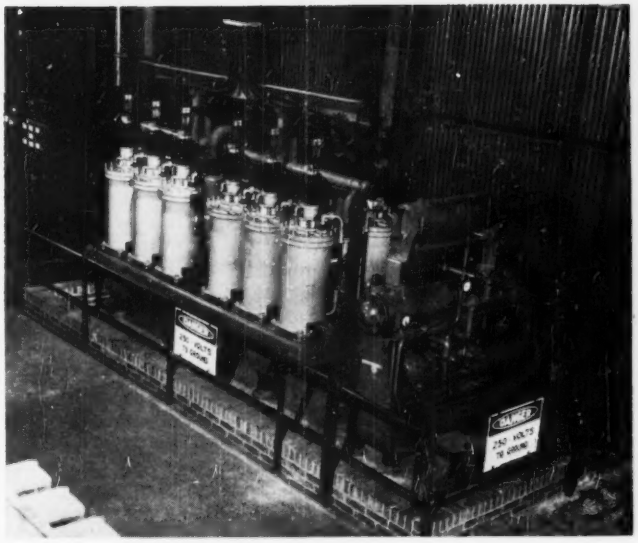
All of the installations are less than ten years old, and none have required overhauling. Because of improvements in design, the single-anode rectifiers should have a better maintenance record than the multi-anode.

Electronic-Frequency Changers

Carnegie-Illinois Steel Corp has been one of the pioneers in the application of electronic frequency changers. Each unit uses two sets of mercury-arc rectifiers. The first receives a-c power at 25-cycles and converts it to direct current. This d-c in turn is fed into the direct-current side of the second set which converts it to 60-cycle alternating current. These units will operate in either direction, that is, convert 60-cycle power to 25 cycles, or 25-cycle power to 60 cycles.

Electronic frequency changers are used for this service because (1) the 25 and 60-cycle power systems do not have a fixed ratio, and (2) it was desired to regulate the power independently of voltages or frequency variations on either system.

Electronic frequency changers have a higher efficiency at all loads than rotating equipment. They provide ease of power flow control, ease of starting with no shock to the system, absence of rotating parts, and low maintenance costs. The overall efficiencies from 66,000 v, 60 cycles to 44,000 v, 25 cycles has averaged about 94%.



TWELVE-TANK RECTIFIER installation in sheet and tin mill is extremely compact

One of the disadvantages of this equipment is that it is not adaptable for a stub-end feed. There has to be a supply of reactive power on both systems conected by the frequency changer. Since both installations connect with large generating systems, this was not a problem.

8,000-kw. Unit Is Flexible Tie

The electronic frequency changer equipment to be furnished to Gary Sheet and Tin Mill will be used as a flexible tie between two a-c systems. It uses pairs of mercury-arc converter units, one unit of each pair operating as a rectifier, and the other unit as an inverter. The systems are tied together by a d-c link. One system is a 60-cycle system supplied by the Northern Indiana Public Service Company and the other is a 25-cycle system supplied by the Carnegie-Illinois Steel Corporation. Pump-evacuated rectifier tubes are used with 12 tubes per converter.

The d-c link type of frequency changer circuit allows the choice of a d-c voltage that will best suit the conditions to be met. A voltage of 1,750-v was selected for this particular system. This voltage is high enough to (1) minimize the effect of arc drop losses inherent in mercury-arc converters, and (2) to provide a balance of d-c current and voltage that is easily handled by conventional switching equipment.

Each 8,000-kw unit has manual base load control, and automatic base load and peaking control in either direction. Each will have automatic control to prevent output of the frequency changer from flowing into the public utility 60-cycle system.

10,000-kw. Unit In Use 5 Years

The two 10,000-kw electronic frequency changers located at the Edgar Thomson Works have been operating for five years. These units can exchange power in either direction between the 69,000-v, 60-cycle system and the 44,000-v, 25-cycle systems. Our 60 cycle system is inter-connected with that of the Duquesne Light Company and the total generating capacity exceeds 600,000 kw. The generating capacity of the 25-cycle system is about 130,000 kw. The 60-cycle frequency is held within 1/10 of a cycle; that of the 25-cycle varies from 23½ to 26 cycles.

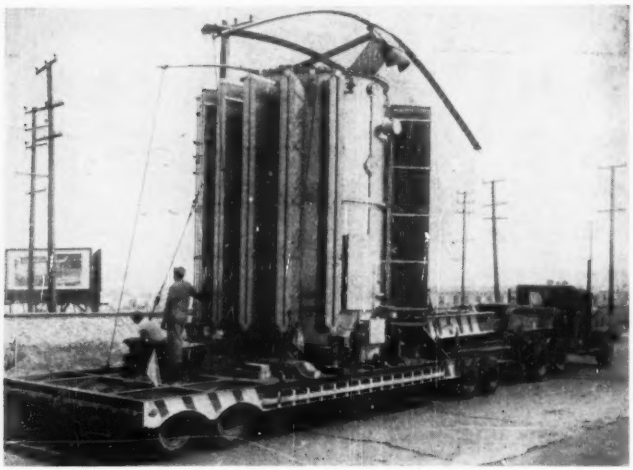
Summarizing the operation of our rectifier units, practically all of the troubles have occurred during the initial periods of operations. Many of these can be attributed to the war time materials and workmanship. A maximum of seven years of service has not necessitated any major rebuilds.

Transporting 110-Ton Transformers

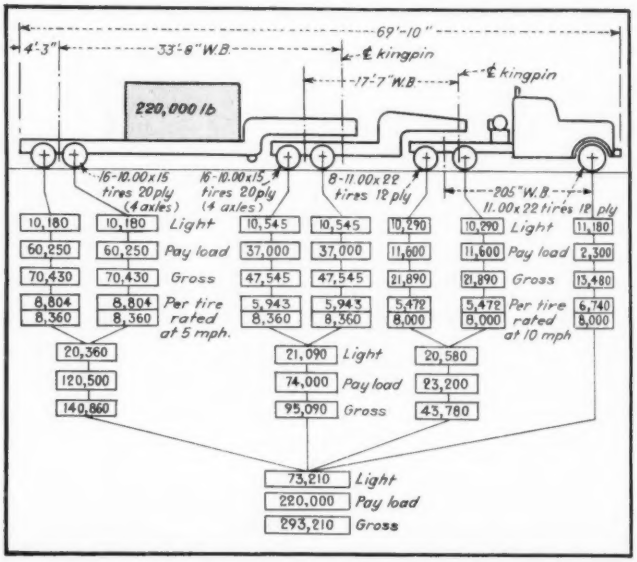
Two-unit and three-unit combination of tractor, adapter and lowbed trailer developed for 60 and 110-ton pay loads

E. W. TEMPLIN
Automotive Engineer

T. H. MULLEN
Supt. of Transportation
Los Angeles Department of Water & Power



THREE UNIT TRUCK-TRAILER built by Los Angeles Department of Water and Power to transport transformers weighing up to 110 tons. It is largest of a fleet of low-bed trucks and semi-trailers rated 5 to 110 tons being acquired by the department



LOAD DISTRIBUTION for 110-ton concentrated load on combination semi-trailer, trailer adapter and truck tractor. Maximum full load speed within rating of tires is 3½ mph.

TO MEET the need for equipment to transport transformers and other heavy equipment, Los Angeles Department of Water and Power is acquiring a complete fleet of low-bed vehicles. Largest of the fleet is a three unit vehicle recently put in service which has a dual rating of 60 and 110 tons.

The combination consists of three vehicles—a truck tractor, "jeep" or semi-trailer adapter, and a lowbed semi-trailer. When all three units are used together the vehicle can carry 110 tons at 3½ miles per hour. Without the semi-trailer adapter the pay-load capacity is 60 tons.

Maximum capacity of the vehicle was dictated by the largest pieces to be moved. These were the Hoover power receiving transformers, which weigh 217,000 lb each. With an estimated 3,000 lb for cribbing, maximum payload capacity required was about 220,000 lb, or 110 tons.

Distribution of loading is shown in sketches. With a 60-ton payload on the tractor and semi-trailer, no tire is overloaded at 10 mph. Loading on the rear axles of the tractor, however, is 11,530 lb over the axle rating of 44,000 lb. This is permissible at the low speed normally used when under full load.

With a 110-ton payload on the three unit combination, loading on the rear tires of the trailer is the limiting factor. Careful placing of the load for optimum distribution allows operating speeds up to 3½ mph.

Specifications for the combination unit are given in the accompanying box. They were developed on the basis of experience of the engineering and transportation sections of the power system's general plant division.

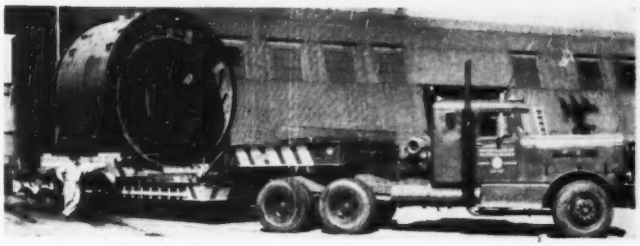
Design Specifications

As a 110-ton capacity unit:		
Loading space		11′ 8¾″ wide × 18′ long
Loading Height	Light	38¼″
	Loaded	36¼″
Wheelbase of Truck Tractor		905″
Wheelbase of "Jeep"		17′ 7″
Wheelbase of Lowbed Trailer		33′ 8″
Location of center of load, approx		6′ 6″ back of gooseneck riser
Underbelly clearance	Light	19″
	Loaded	16¼″
Overall length		69′ 10″
As a 60-ton capacity unit:		
Loading space		11′ 8¾″ wide × 18′ long
Loading height	Light	38¼″
	Loaded	37¼″
Wheelbase of Truck Tractor		905″
Wheelbase of Lowbed Semitrailer		33′ 8″
Location of center of load, approx		13′ 0″ back of gooseneck riser
Underbelly clearance	Light	19″
	Loaded	17½″
Overall length		56′ 8⅝″

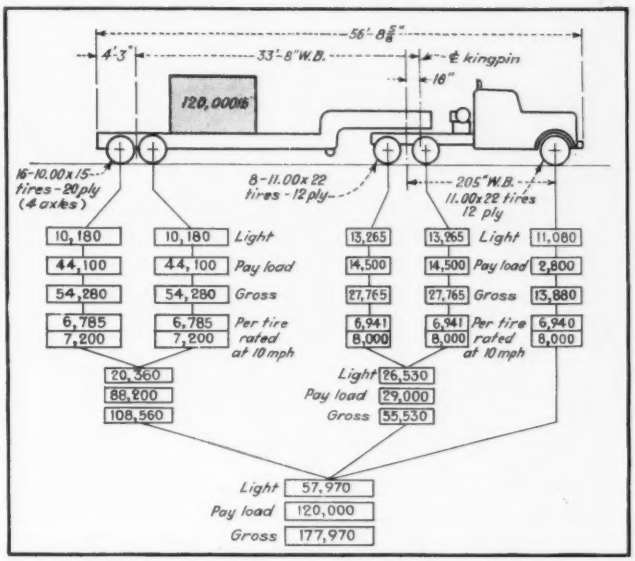
These sections have in past years developed a number of practical innovations to aid in the selection of transportation equipment and its adaptation to power system construction and maintenance.

Value to a utility of such development work is well illustrated by a few examples of past accomplishments: Crew truck bodies especially arranged to facilitate work and safety of the crews; aerial ladder tank truck for washing power line insulators; underground power line cable pullers; and pole setting truck equipped with hydraulic pole puller.

Units now in operation or on order complete the department's fleet of lowbed vehicles. The fleet will include 5, 10, and 15-ton lowbed trucks equipped with power-operated cranes, and 20, 40, 60 and 110-ton lowbed semi-trailers with truck tractors.



WITHOUT "JEEP" ADAPTER unit is rated 60 tons. Reinforcing beam along side of trailer serves as anchor for securing load



LOAD DISTRIBUTION for 60-ton load without adapter, using only semi-trailer and truck tractor. Maximum full load speed is 10 mph

Meter Disk Straightened in Light Box

AN INGENIOUS light box has made the job of straightening meter disks simple and easy at the meter shop of the Cleveland Electric Illuminating Co. Disks removed from meters, in the course of rebuilding or conversion, are checked in this device to make certain that they are perfectly flat and exactly perpendicular with the meter shaft. See illustration.

The light box is simple to build. It is merely a rectangular plywood box that encloses a small fluorescent lamp and has an inverted T-shaped opening cut in one of its vertical faces. This opening is covered on the inside by opal glass scribed with two interesecting perpendicular hair lines. A meter frame complete with pivots is mounted on the face of the box, over the opening, to support the meter disk and shaft assembly.

This meter frame is positioned so that the hair lines on the opal glass correspond exactly with the axis of the meter shaft and the plane of the disk when they are in perfect alignment. Thus when a meter shaft and disk is mounted in the device, for checking, any misalignment can be detected by comparison with the reference lines on the ground glass.

IMPROVED direction of sales activities results from use of this machine

Sales Operations Facilitated

Addressing machine adapted to market coverage problems . . . Accuracy, flexibility and speed obtained in preparing and controlling sales

H. H. BERRY*

Philadelphia Electric Co
Philadelphia, Pa

WHAT UTILITY sales executive, living day-to-day with the problems of maintaining customer and prospect lists accurately and of using them effectively, would not welcome a system of list control and use that, in one case on record, has reduced cost 87% and preparation time from three weeks to two days?

Sales activities of utilities, often conducted in cooperation with manufacturers of appropriate equipment for the promotion of specific applications, must be planned in detail.

A completely successful operation demands the selection of those customers who most need the particular application to be promoted and who can be contacted by the salesman within the allotted time. Necessary also is assurance that the advertising material will get into the hands of the right individuals in the selected establishments or plants immediately prior to the personal follow-up call by the salesman.

In the past, the accomplishment of these objectives has been somewhat less than satisfactory. The selection of a particular market could be effected only in a general way. The preparation of typed customer and prospect lists for each activity, through information obtained from individual salesmen, was time consuming and often of doubtful accuracy. Lists from previous activities were obsolete; revisions were costly. Dependence on outside addressing agencies for scheduled mailing dates was a slender reed upon which to lean, and errors in transcription of addresses resulted in high returns from the post office.

The resumption of active sales promotion following the end of the war brought this problem to the direct attention of the industrial and retail sales department of the Philadelphia Electric Co. A special committee investigated numerous methods of obtaining selective mailings, and recommended the purchase of mechanical addressing and selecting equipment.

Further study disclosed possibilities of use in connection with other important work of the department. Current customer lists based on type of service, rate and riders are highly valuable for statistical purposes. Current and accurate mailing lists for numerous periodicals sent to selected customers at regular time intervals remedy a former unsatisfactory situation. It is confidently expected that the future will produce additional

*Manager, Office Division, Industrial and Retail Sales Department

uses for the equipment.

The system is designed to:

1. Maintain a current list of customers adaptable for selection by groups or combination of groups in accordance with recorded customer facts. (See panel of customer facts)

2. Maintain current lists of employees and customers who receive various publications periodically.

3. Prepare customer lists from selected customer facts.

4. Prepare selected prospect and mailing lists for use in specific sales activities.

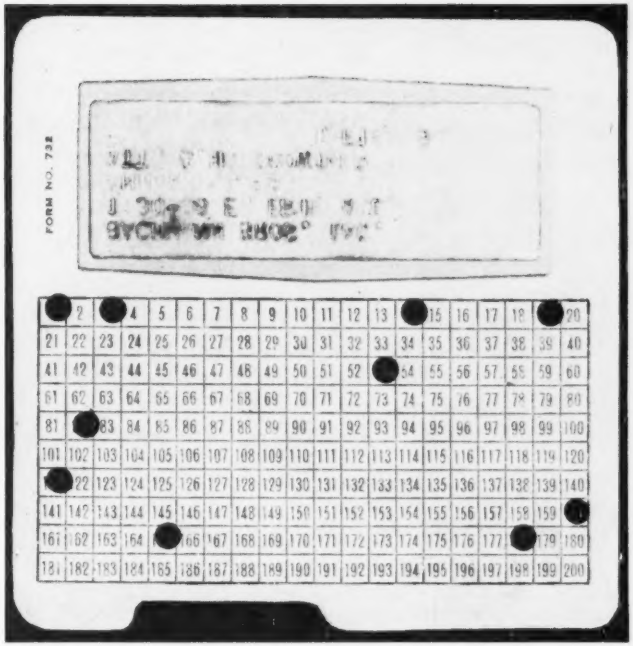
5. Address envelopes, self-mailers, etc for mailing letters, periodicals, and advertising and promotional material to selected customers.

The equipment consists of the addressing machine with a 200-position panel selector, stencil cutter, stencil-filing cabinets, stencils and miscellaneous supplies. One operator is required. For the printing of stencils, the 200-position panel selector permits the selection of groups of predetermined customers by any customer fact or combination. The stencil card (4 x $4\frac{3}{32}$ in.) consists of a stencil area for the name and address of the customer and a control area with spaces numbered from 1 to 200 for the code recording of customer facts by punching the numbered spaces.

Determination of Classifications

Flexibility and accuracy in the selection of a particular market are obtained by filing the stencils alphabetically in the customers' business classifications. Classifications are determined by the "Standard Industrial Classification Manual," issued by the Division of Statistical Standards, U. S. Government. After careful analysis, 72 classifications (major and subdivision) were selected as representative of the types of business handled by the industrial sales divisions. The retail (commercial and rural) sales division selected 19 classifications. Each customer was assigned to his proper classification and the respective stencil was marked with the determined business classification code. Stencils were also code-punched for other pertinent customer-fact data.

The system provides many aids to the work of the department that were not available before. Many operations



EVERYTHING to know, saleswise, about the customer is recorded on this card

now performed were previously impossible or impracticable to accomplish. Operations that were performed before are now accomplished faster and at less cost.

Accurate current customer lists available for use by the various divisions are a departmental asset of real value. The production of selected customer lists for use in promotional sales activities assures a complete coverage of a chosen market with a minimum of time and effort. The right timing obtained between the receipt of literature by the customer and the following personal call of the salesman produces a situation favorable for excellent sales results. The production of special customer lists for statistical purposes represents a great improvement in quality of data prepared plus a considerable reduction in the time of procurement.

The addressing of envelopes, self-mailers, etc for all purposes (a new function in the department) has

Customer Facts Recorded

Printed on the stencil area of the card are (1) Name, (2) Address, (3) "Attention of," (Name of individual) and (4) Classification item.

The classification item shows in code the group segregation (industrial, retail, rural or periodical); the geographic location (Company, District, Division); the salesman concerned; and the business classification of the customer.

Inclusion of the classification item in the stencil area provides identification, convenient sorting, and a knowledge of primary customer facts on each printing from the stencil.

Code-punched on the control area of the card are data showing: (1) Urban (Phila. City) and suburban groups; (2) Business classification (Standard Industrial); (3) Company (PE Co. Susidiaries); (4) Type of customer (Electric, Gas, Steam); (5) Geographic location (Company, District, Division); (6) Salesman concerned; (7) Rates; (8) Riders to contracts; (9) Specific billing groups (100 kw demand and over, etc); (10) Users of specific service applications (air conditioning, ventilation, etc); (11) Prospects for specific service applications; (12) Miscellaneous information not otherwise covered; (13) Potential for increased load (Grades A, B and C).

Savings Effected by Mechanical Addressing Equipment

Comparisons of time, work and cost of run-off of 4,000 industrial customers on duplicate slips in preparation for a sales campaign

	NEW METHOD	OLD METHOD
Time required for preparation of list	48 hours	3 to 6 weeks
Number of employees involved	1 (Operator of equipment)	23 men (1 stenographer, 18 salesmen, 4 sales supervisors)
Time charged to operation		
Preparation—hours	14 (Operator)	40 (Stenographer) 28 (Intermittent time of salesmen and supervisors)
Addressing—hours	6 (Operator)	Done by outside agency, one week required
Total time charged—hours	20	68
Cost (Based on 100% for old method)		
Preparation—Percent	9	27 (Stenographer) 50 (Salesmen and supervisors)
Addressing—Percent	4	23 (Outside agency)
Total cost—Percent	13	100

saved money and proved most satisfactory in cutting down the number of returns and controlling the date of mailings.

A specific example of one operational performance in the industrial field gives a general idea of the very considerable reductions in time and cost effected by the new system.

On September 8, 1948, a run-off was made of practically all the industrial customers (4,000) in duplicate on paper slips in preparation for our fall lighting campaign. Within 48 hours, each salesman received the slips for his particular customers, divided between prospects and non-prospects. This job required 14 hours work by the operator of the machine. This operator was the sole employee involved in the work which (after review of prospects by the salesmen) required only the addressing of the envelopes, a matter of six hours, to be complete.

Previously, customer lists, made up from existing lists with current additions, were typed by hand and distributed to the salesmen. Each salesman eliminated off-system customers, added new customers, and indicated prospects on this list. Two lists were then retyped—one list of the prospects for the salesmen, and one complete revised mailing list for the outside addressing agency. Time for this job varied from three to six weeks. The minimum figure of three weeks includes considerable intermittent time of all salesmen and supervisors, plus the full time of one stenographer for one week.

A summary of this particular example, in an accompanying panel, shows a saving of 87% in favor of the new system, as well as a reduction of at least 12 days in time required for the operation. It is not an exaggeration to state that all operations of a similar nature show the same remarkable savings in time, labor and costs by use of the equipment.

Although in operation on current production for a relatively short time—through 1948—the results obtained in all the system's many functions far exceed original expectations. In the period from January 20 to November 12, there were turned out 78 distinct production jobs involving the preparation of selected customer lists, addressing for sales activities, addressing for periodicals and addressing for special mailings. Separate paper slips and cards for customer lists numbered 54,885, and envelopes and self-mailers, 127,465, a total of 182,350 pieces.

Savings Will Cover Total Cost

Bearing in mind the considerable reductions in cost noted for a single operation involving only 4,000 customers, it is conservatively estimated that the saving in expense to be effected in the first two years of operation will cover the total cost incurred for the purchase and setting up of the equipment. The year 1949 will show a considerable expansion both in the volume of material turned out and in the variety of functions performed.

From its performance so far we conclude that the adaptation of the mechanical addressing equipment, to the market coverage problems of the industrial and retail sales department of the Philadelphia Electric Co, has resulted in these outstanding advantages: (1) Complete coverage of chosen markets for industrial and commercial promotions; (2) accurate current customer records for prospect, mailing list and statistical purposes; and (3) reductions in time, labor and expense through efficient and economic operation.

Office Lighting Planned for a Purpose

The Edwin F. Guth Co

SHADOWLESS, GLARELESS LIGHTING, evenly distributed from inconspicuous sources, was the specification for the general office area of the Allen B. Wrisley Co, Chicago, Ill. It was met by installing continuous lines of 4-ft troffers in the 12-ft ceiling. Lines are 5 ft apart. Each troffer contains two 40-w lamps with a longitudinal baffle between them. This gives a light cut-off of 45 deg. The office area is 130 x 100 ft and 480 troffers are used. Average illumination is 62 ft-c at desk level after 1,500 hr operation

Look for this tag—

when you buy fluorescent fixtures

This tag identifies a fluorescent fixture equipped with a G-E ballast. Look for it. It means that the manufacturer has utilized the advantages of the industry's finest ballast to assure rated lamp life and light output . . . quiet and trouble-free operation.

General Electric ballasts are lamp-matched. They are designed, built, and tested to get the most out of standard fluorescent lamps—to give you the kind of lighting you are looking for. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

FLUORESCENT LAMPS, unlike incandescent lamps, do not draw current directly from the lighting circuit. Instead they draw their current through a special transformer or ballast mounted in the fluorescent fixture.

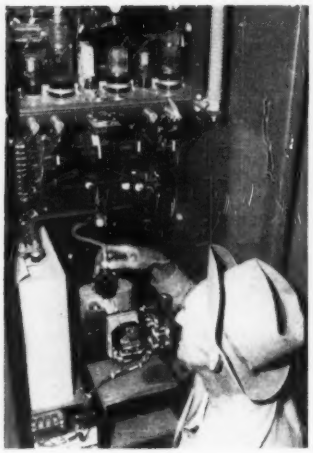
With fluorescent lighting, therefore, the amount of the light you get from the lamp, the life of the lamp and, to some extent the life and efficiency of the fixture itself, depend to a large measure on the characteristics of the ballast. Good ballasts mean better lighting.

GENERAL ELECTRIC

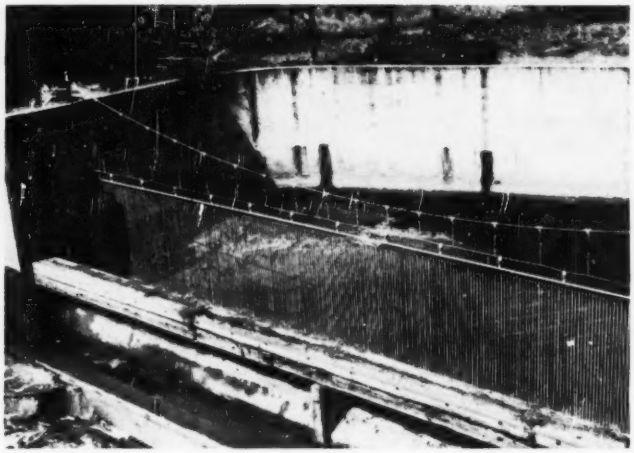
412-48

HOW TO DESIGN • CONSTRUCT OPERATE • MAINTAIN

Electric Screen Diverts Fish From Hydro Plant



ELECTRONIC CONTROL impresses 6-cycle, 700-v impulses on fish screen across intake



ELECTRODES suspended in water over buried ground wire across 80-ft intake give off timed electric impulses which divert migrant fish into river channel away from forebay of the plant

GAME FISH on Hood River, glacier-fed stream draining from Oregon's Mt. Hood, now have the aid of a new electronic fish screen to help them find their way downstream past the headworks of the Pacific Power & Light Co's Powerdale hydro-electric plant.

Performance of the screen, installed this fall, is being watched closely by officials of the power company and by fish authorities. Major down stream migration, which the screen is designed to guide, comes early next spring.

The device consists of a lattice of 10-ft electrodes strung across the mouth of the intake canal as shown. A ground wire is buried at the bottom of the opening. From the control mechanism electrical impulses at 700 v are sent out at the rate of six per second.

Fish entering the field of the screen are "tickled" by the impulse and diverted to the natural channel of the stream.

The device was installed by one construction crew of the Pacific Power & Light Co.

Power Factor Indicator Built From Watthour Meter

LAWRENCE G. BETZ

Assistant Division Meter Engineer
Public Service Electric and Gas Co
Hackensack, N. J.

A PROCEDURE is outlined for converting a 5-amp, 120-v, type I-14 watthour meter to a "null" indicator for a specific power factor. The conversion is feasible when a conventional power-factor indicator or phase-angle meter is not available. If more than one power-factor setting is required, a meter for each setting should be built. As an example, when testing thermal demand meters at 50% power factor, one indicator should be built for that power factor and another for 100% power factor.

Principle of operation of the converted meter is based on the fact that by inserting a resistor in series with a watthour meter potential coil, (see illustration) the voltage flux is led by a certain phase angle, depending upon the value of resistance compared with the series circuit impedance. If the indicator potential and line current fluxes can be made to have a quadrature relationship, then there will be zero rotation at a desired power factor. The full quadrature (90 deg) lead is effected

type RF disconnects

AT DES MOINES SUBSTATION IOWA POWER AND LIGHT CO.

★ Nine G-E Type RF disconnects rated 161 kv with three G-E Type FK-439 oil circuit breakers

positive operation under

'glaze storm' and other

severe weather conditions

There's no need to worry about jammed or frozen switches when you use G-E Type RF disconnects. You get "easy operation" because the new blade-actuating mechanism is of simplified construction and antifriction bearings are used on all main moving parts. Also, the "sequential operation" movement firmly forces and locks the blade in the contacts under all weather conditions.

Silver-to-silver line-pressure contacts are used for all current-carrying duties. This means low contact losses and complete elimination of current-carrying braids. Controlled-contact pressure does away with unnecessary scoring, chewing and excessive wear on the silver contact surfaces. All these features mean better service and lower maintenance costs for you.

See your G-E sales representative about the new RF disconnects for 7.5 to 230-kv service. Write for bulletin GEA-4980. *Apparatus Department, General Electric Company, Schenectady 5, New York.*

GENERAL ELECTRIC

660-8

partly in the meter and partly by choice of a voltage source which leads the line current by 60 deg.

For a 50% power-factor indicator, steps in the conversion of a watt-hour meter are:

1. Remove the register from the watthour meter.

2. Remove the strap between terminals 2 and 3.

3. Procure a 1000-ohm, 25-w adjustable resistor.

4. Mount the resistor on brackets in place of the removed register. Connect the resistor in series with the potential coil and the assembly to terminals 2 and 3.

5. The current coils should be connected through a current transformer, where necessary, to the test load. The potential terminals should be connected to the voltage source for the meters under test.

6. Calibrate by imposing a known 50% power-factor load and adjust slides on the resistor so that the disk stops.

7. A label "Stops at 0.50 PF" should be affixed inside the glass cover.

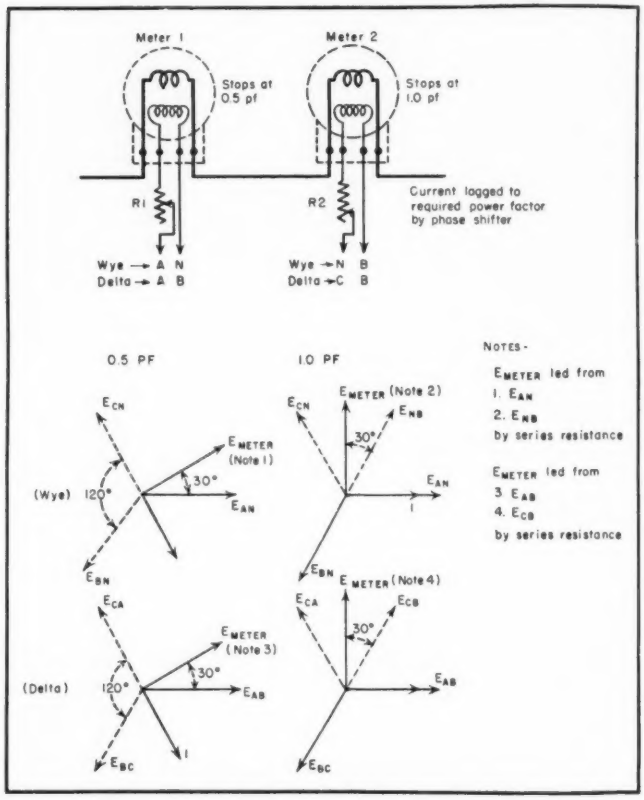
For a 100% power-factor indicator the necessary steps are:

1. All steps as indicated in the foregoing paragraphs for the 50% power factor indicator should be followed with the exceptions listed.

2. Instead of connections as in Step 5 above, the potential terminals should be connected to a phase which leads the voltage source by 60 deg. As an example, if the current source is derived from phase A-N of a 3-phase, 4-wire supply, for the unity power-factor indicator the phase supplying potential should be N-B.

3. Calibrate by imposing a known 100% power factor load and adjust slider on the resistor so that the disk stops.

4. A label "Stops at 1.0 PF" should be affixed inside the glass cover.



POWER FACTOR indicators converted from watthour meters. R1 and R2 are adjustable 1000-ohm, 25-w resistors. Connections shows a single-phase loading derived from phase A-N of a 3-phase, 4-wire (wye) source, also from phase A-B of a 3-phase, 3-wire (delta) source. Phase of current was shifted for loading at 100% and 50% power factor runs. Vector relations of meters are shown for wye and delta power sources

Tortional Vibration on Motor-Driven Chipper

R. V. SHEPHERD

Large Motor and Generator Engineering Division
General Electric Co
Schenectady, N. Y.

UNTIL RECENTLY, most synchronous motor driven wood chippers have been in the 200 to 600-hp range with the motor rotor mounted on the chipper shaft and relatively close to the chipper disk. The large chipper shaft, which supports the combined weight of the motor rotor and chipper, is also quite stiff torsionally. Hence, for such an arrangement, the torsional natural frequency of rotor and chipper inertias through the resilience of the shaft is usually considerably higher than the forced frequency imposed on the chipper disk by the knives engaging the log.

A wood chipper is essentially a large rotating disk having a number of radial knives set into its face. Logs fed endwise toward the face of the disk are chipped by the rotating knives into small pieces for further processing into paper.

Large Chipper Built

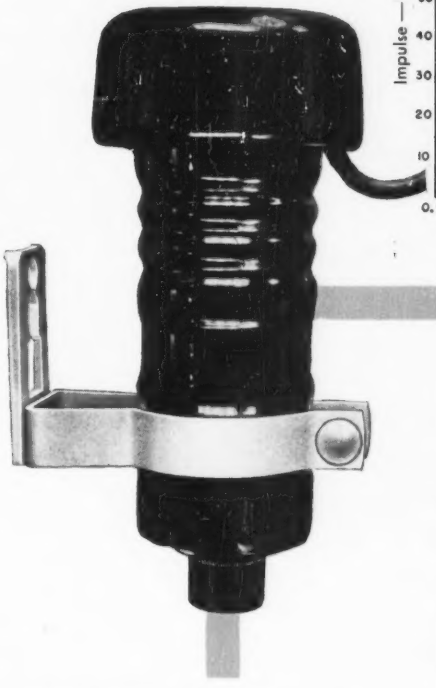
Recently a 1500-hp, 240-rpm synchronous motor (Fig 1) was built to drive a 4-knife chipper capable of chipping a 40-in. diam log at the rate of one ft per sec. Because of the size of the motor and chipper, each was built with its own base, shaft and bearings. The shafts were connected by a coupling. During the design of the motor it was found that a normally designed motor shaft would cause the torsional natural frequency of the system to be quite close to the forced frequency of 16 cycles per sec.

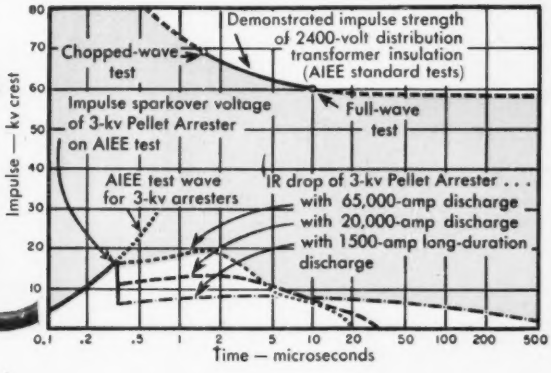
To avoid high shaft stresses, with

No other distribution arrester

Protects

. . . so well





The G-E Pellet arrester is also "tops" for endurance. It is the *only* distribution arrester with series gaps sealed in dry, inert nitrogen (N_2)—keeping gap electrodes bright as new during years of service operation. Pellets, themselves, are of lead peroxide—a distinctive valve element, self-protecting against service moisture—unaffected by condensation, or humidity. Pellet arresters have large discharge capacity—they withstand easily the AIEE and NEMA standard 65,000 ampere impulse test.

This graph, made from actual volt-time and ampere-time cathode-ray oscillograms, demonstrates the protection afforded distribution transformers by the G-E Pellet arrester. No other distribution arrester limits lightning voltages so low for small, medium or high lightning currents.

This co-ordination chart is based on the 3-kv arrester protecting a 2400-volt transformer. Similar charts for Pellet arresters of higher ratings protecting higher voltage class transformers demonstrate the same advantages in unequaled margin of safety in protection. This *extra protection* results from the combination of low sparkover voltage and exceptionally low IR drop, that together hold lightning voltages to lower levels than does any other distribution arrester.

You buy better protection when you buy Pellet arresters! The Quality-Standard of the Industry for more than 25 years.

Apparatus Department, General Electric Company, Schenectady 5, New York.

GENERAL ELECTRIC

6 Months Faster

on power transformers... when they're "RM listed"

Certain G-E power transformers, within the complete G-E line, have for a number of years been designated as "repetitive manufacture," or "RM" for short. These are standard transformers—that lend themselves to quantity production.

Because RM-listed transformers have standard E.E.I.-NEMA voltage ratings and the most popular kva ratings—and are available in standard designs, with only the most popular types and locations of accessories—much of the engineering and drafting for any particular order is already done. Likewise, many of the component parts can be mass-produced—and jigs and fixtures required in their building are already on hand—thereby cutting construction time.

As a result RM-listed transformers can be delivered sooner—anywhere from six to ten months sooner than specials.

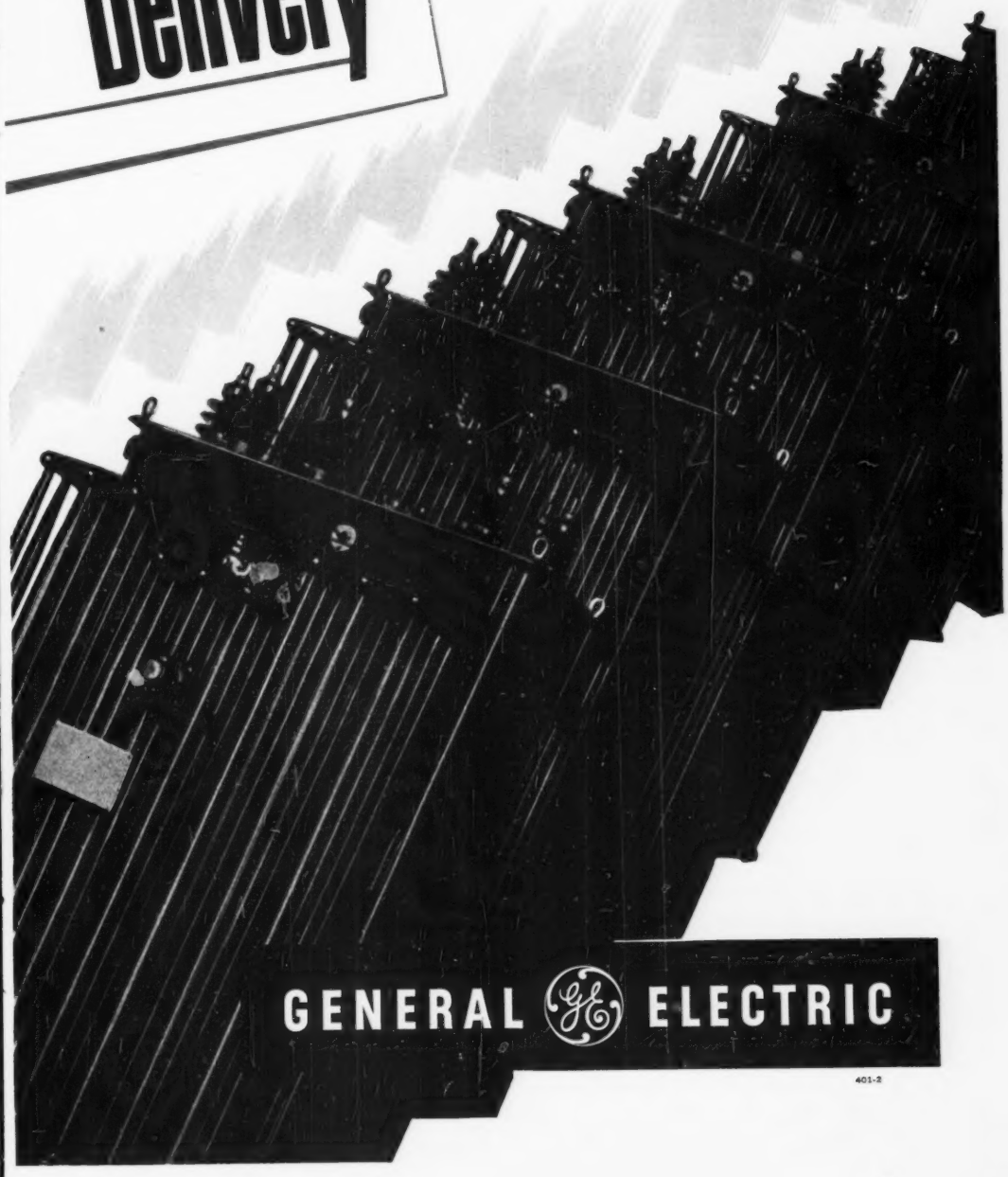
For the same reasons, they can be built more economically—with the economies passed on to the purchaser in the form of lower prices, compared with non-RM transformers of identical ratings.

RM VOLTAGE RATINGS NOW CONFORM TO E.E.I.-NEMA STANDARDS

The voltage ratings of RM transformers now conform to the preferred ratings established by the joint committee of E.E.I. and NEMA. In all, nearly 3500 combinations of primary and secondary voltages, and kva's are available in RM designs. With four 2½-percent voltage taps standard, and with forced-air cooling as optional, these transformers are now suitable for even more widespread application.

Complete information on the latest listings of RM transformers is in the hands of our Apparatus Department Office nearest you.
Apparatus Dept., General Electric Company, Schenectady 5, N. Y.

Delivery



GENERAL ELECTRIC

401-2

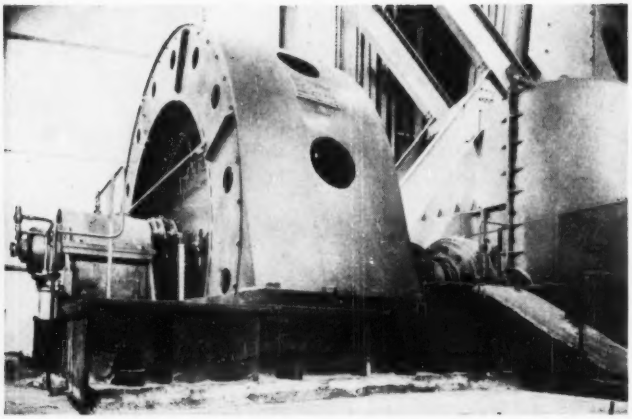


FIG 1—SYNCHRONOUS MOTOR, rated 1500 hp, 240 rpm, 2300 v, 80% power factor, is designed for direct connection to a 4-knife, 34-ton, 174-in. diam chipper disk

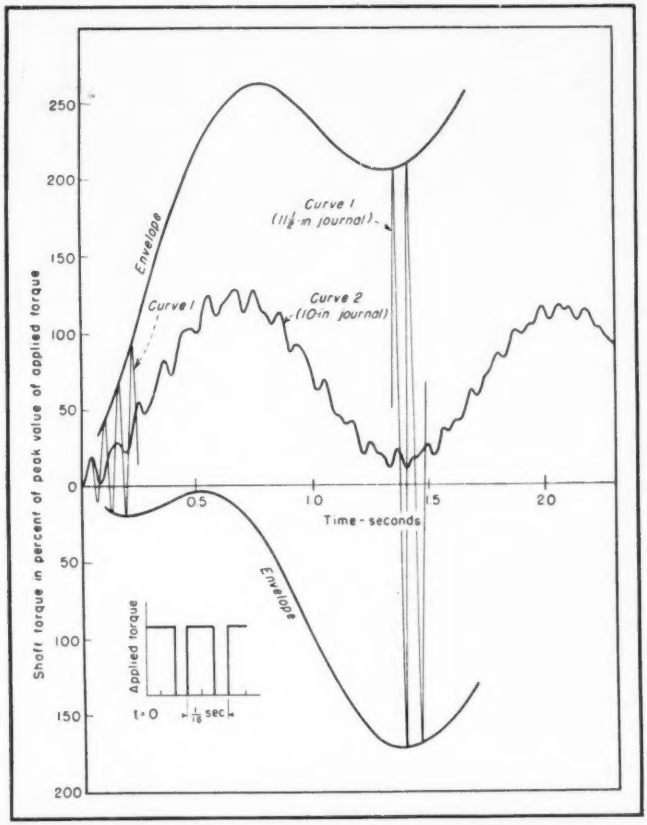


FIG 2—TORSIONAL VIBRATIONS on a 10-in. and a 11½-in. diam motor shaft journal. Shaft torque of the 10-in. journal has a natural frequency of about 65% of the forced frequency. For the 11½-in. journal, the natural frequency is 98% of the forced frequency

possible shaft failure due to fatigue, it was necessary to redesign the motor shaft so as to separate the values of forced and natural frequencies of the system. Since about 40% of the motor shaft flexiblity was in the journal, a special bearing was designed to accommodate a journal of smaller diameter and increased length, thereby decreasing the torsional rigidity of the motor shaft and reducing the natural frequency to a value below the forced frequency.

During the study of this problem, solutions showing the effect of variation in shaft stiffness were obtained by means of the differential analyzer. Several of the curves obtained are shown in Fig 2.

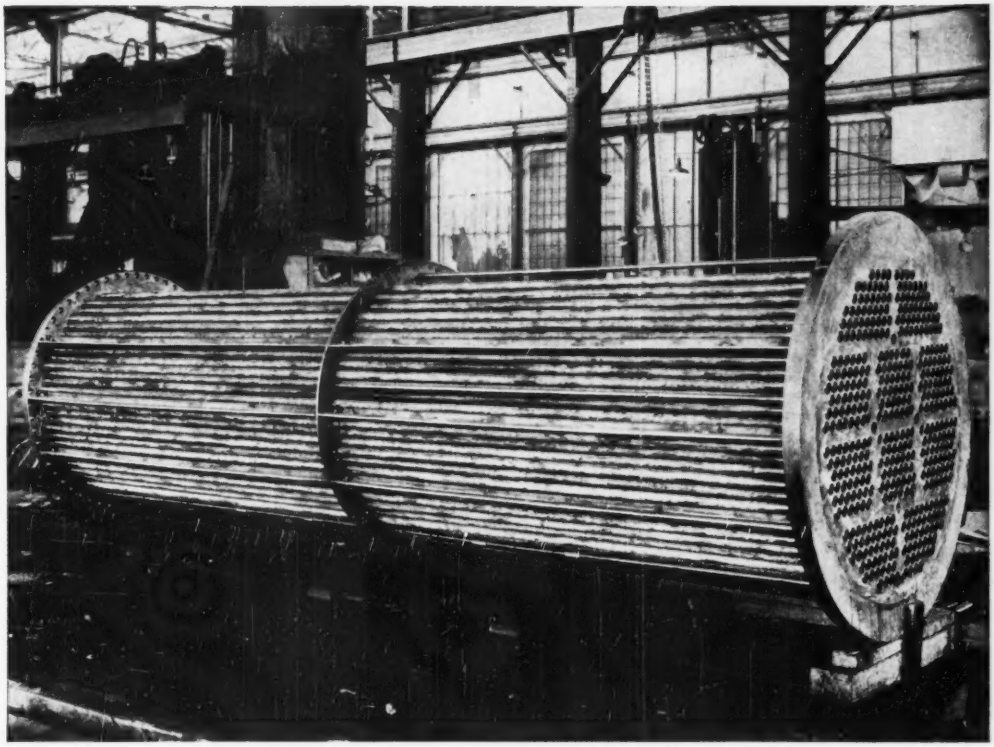
Curve 1 shows several cycles of the shaft torque pulsations and the envelope curves of the peak values of these torque pulsations for a 11½-in. diam journal. In this case the natural frequency was 98% of the forced frequency. Curve 2 shows the shaft torque for a 10-in. diam journal giving a natural frequency of about 65% of the forced frequency. In both curves the low frequency modulation is the frequency determined approximately by the total inertia of the system against the synchronizing torque of the motor.

Advantages of 10-in. Journal

The stress in the 10-in. journal is about 75% of that in the 11½-in. journal at the first torque peak (at ¾ sec). This ratio would be less for subsequent torque peaks as the peaks increase on Curve 1 and decrease on Curve 2. In addition to having less stress, the 10-in. journal is not subjected to the violent torque pulsation and torque reversals which might eventually cause the fatigue failure of the 11½-in. journal.

The motor was built with a shaft having approximately the characteristic shown in Curve 2.

If the chipper had had six instead of four knives, the shaft torque with an 11½-in. shaft would have been approximately as shown by Curve 2, since for these conditions the natural frequency would have been about 65% of the forced frequency. No simple generalization can be made, except to say that each case must be considered separately to see that the forced and natural frequencies do not lie too close together.



ELECTRICITY CAN BE CORROSIVE, TOO

OPERATORS of condensers are well-informed and follow sound general practices that should result in satisfactory tube life, but it has been estimated that in about 90% of American plants there is at least one piece of equipment that shows tube trouble. Such cases interest Revere greatly, because we want condenser tubes to give satisfactory, economical service.

Sometimes the causes of premature failure are obscure and difficult to discover. One of them is stray electricity. When you remember that copper plating is usually done at about 4 to 6 volts, you can see that it doesn't take much to move metal from one place to another through a fluid. Any flow of current through a condenser is sure to be destructive.

Electricity often finds strange routes to ground through high-resistance shorts that do not show up through blown fuses, overheated parts, arcing, and similar obvious indications. Pump motors, for example, may work perfectly well, but permit a little "corrosive" electricity to pass along to ground through the condenser; electrolysis results. Galvanic action, due to the use of metals of too-great dissimilarity, may also occur, but is rare in a condenser properly designed for its operating conditions.

So Revere suggests you include electricity as a possibility when seeking the causes of unexpected tube failure. And it is also advisable to save samples cut from failed tubes, to be sent to Revere for laboratory examination. Facts thus scientifically uncovered may lead to recommendations that will solve the problem. If you have a condenser tube problem, ask Revere to help.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.

• • •

Sales Offices in Principal Cities, Distributors Everywhere

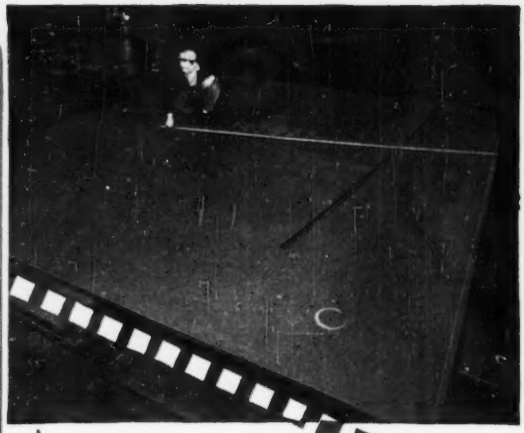
TANK CONSTRUCTION

ANOTHER IMPORTANT PHASE IN THE MANUFACTURE OF

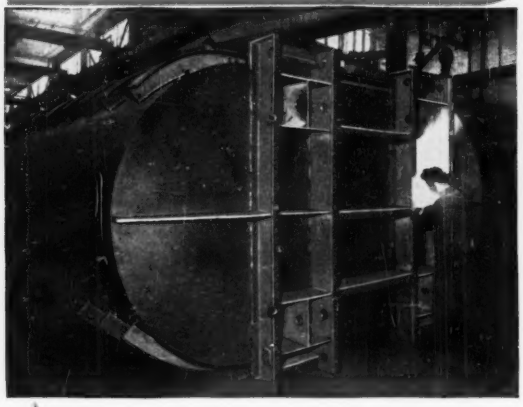
The importance of good tank design and construction is sometimes overlooked by purchasers of power transformers. Tanks which are poorly designed and improperly built can result in extra installation and maintenance expense.

A transformer tank must be a ruggedly-built structure, not only to support the weight of the core-and-coil assembly, oil, and various auxiliary parts, but also to withstand, without distortion, the stresses and strains imposed upon it in shipment and installation.

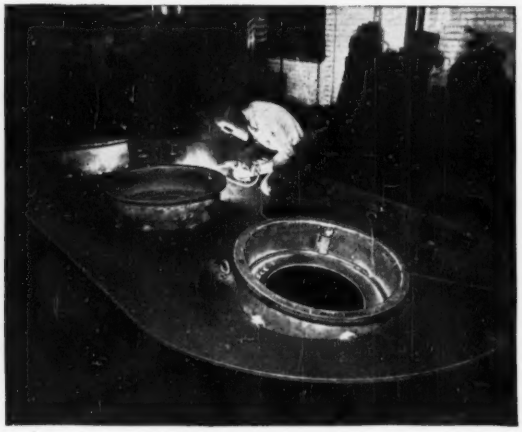
It is because Moloney has long recognized the importance of proper tank construction, that you will find Moloney transformer tanks particularly well-designed and well-built.



1 Next in line of importance to the engineer's job of designing the tank, is that of the layout man in accurately marking the steel plates and shapes for other workmen to perform the cutting, bending, and welding operations which convert these materials into a completed tank.



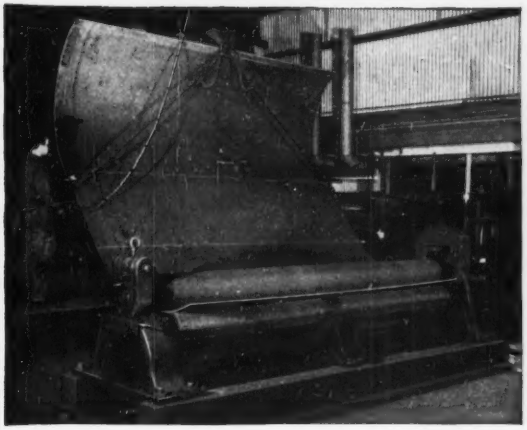
4 In order to support the tremendous weight of a large power transformer the base must be strongly constructed. Here we see the steel reinforcing structure being welded to the tank base. Heavy steel beams and channels prevent distortion and provide weight support, enabling the transformer to be moved on its own wheels or on rollers, without damage.



5 The tank cover must not only provide a weather-proof, gas-tight seal, but must also support the bushings. Photo shows bushing collars being welded to cover. Since bushings used on large, high voltage power transformers are quite heavy, steel reinforcements are welded to the underside of the cover. After completion of this operation the cover is punched for bolting to the tank.

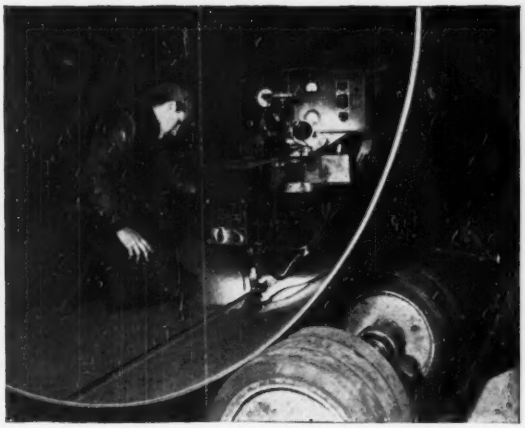
MOLONEY

POWER AND DISTRIBUTION TRANSFORMERS EXCLUSIVELY SINCE 1896 • FACTORIES AT ST. LOUIS,



2

Here we see steel being rolled to form a section of the tank wall. The workman is operating the overhead electric crane holding the steel while the rolls operated by another workman curve the steel plate according to the layout man's markings. As this operation progresses, it is checked again and again until the exact shape specified is obtained.

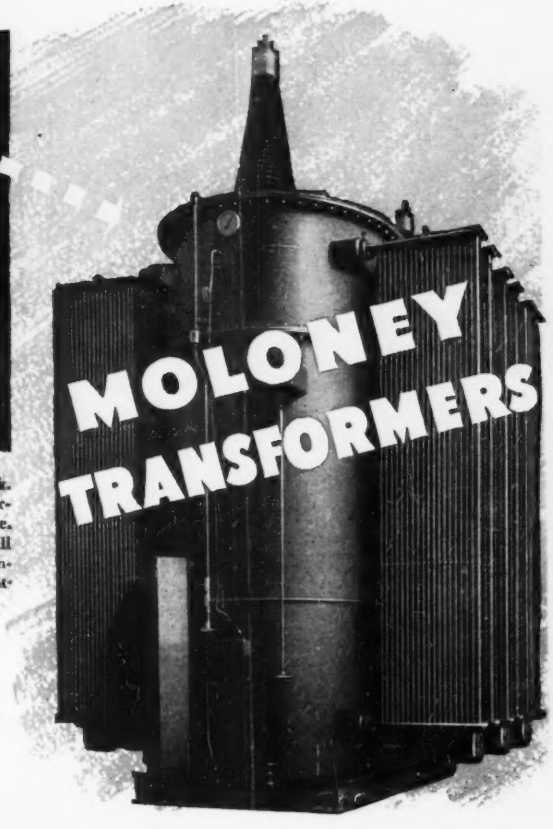


3

After shaping, the tank sections are welded together by means of automatic seam welders. The seams are welded both on the inside and outside. Shown here is the inside seam welding operation. After this, heavy steel angles or Z bars are welded to the tank wall to provide reinforcement, enabling tank to withstand, without distortion, pressure of the cooling oil and stresses encountered in shipment and installation.

6

Shown here is the final inspection of the transformer tank. Every welded seam, and every connection point is thoroughly examined for possible leaks under air pressure. The inspector is covering the seams with a liquid which will indicate even the most minute leak. After this careful inspection the tank is completely sand blasted and then painted before the core-and-coil assembly is installed.



ELECTRIC COMPANY

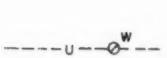
MISSOURI AND TORONTO, ONTARIO, CANADA.

Symbols Developed for Distribution Maps

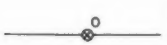
III—Street Lighting Circuits

Series of symbols listed here have been standardized by Georgia Power Co for use on both construction prints and distribution maps

Without transformer	With transformer	Series Lamps, candlepower	Multiple Lamps, watts
		60	60
		80	75
		100	106
		250	175
			200
		400	300
		600	370
		1000	575



Whiteways should be shown as a system. Where it is diffcult to distinguish incidental whiteway lights, they may be marked as shown.



Ornamental bracket from overhead supply. Following designation shall be used to indicate type of fixtures: B=bracket; M=mast arm; S=center suspension; O=ornamental; W=whiteway. General: All fixtures shall be assigned a location number. Special fixtures shall be so marked.

Solenoid-operated oil switch.

Solenoid-operated oil switch with enclosed time-clock.

Time-clock control.

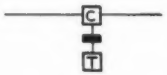
Photoelectric control.

Manual switch. Note as to type.

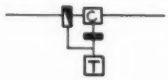
Relay, air break, series or multiple.

Arc loop protector.

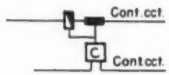
Constant current transformer.



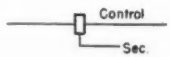
Constant current transformer with solenoid-operated oil switch, time-clock control.



Constant current transformer with solenoid-operated oil switch; time-clock control with arc loop protective relay.



Constant current transformer with solenoid-operated oil switch; cascade connection with arc loop protective relay.



Multiple relay control.

Note: Conventional symbols shall be used to indicate switches with necessary appropriate notes.

Adapted from a paper *Distribution Mapping* by W. F. Poole, Distribution Engineer, Georgia Power Co, Atlanta, Ga, before Southeastern Electric Exchange, at Tampa, Florida. This article concludes a 3-part series which began in ELECTRICAL WORLD, November 20, 1948.

SOUND CONSTRUCTION ASSURES

LONGER SERVICE LIFE

FROM TIREX PORTABLE CABLES

Simplex-TIREX Portable Electric Cables are carefully designed with an eye opened wide to the exacting and, very often, abusive conditions under which they must work. Toughness, flexibility, and safety are given top consideration and the result is a cable construction suited to day-in, day-out operation wherever the going is tough.

Check the advantages of this construction now. Keep them in mind. And next time you need cables for use on any portable electric equipment from hand tools to heavy shovels, remember to specify TIREX and profit by the dependable, low-cost cable service these features provide.

Conductors of TIREX Cables consist of small copper wires properly stranded together to provide non-kinking flexibility.

Conductor Insulation is a rubber compound having stable electrical properties and the mechanical strength necessary to withstand rough usage.

An **Inner Jacket** of durable rubber applied over the assembled insulated conductors forms the inner part of a tough protective covering for TIREX Cables. It provides a cushion for the conductors and protects them from mechanical shock whenever a cable is twisted or crushed.

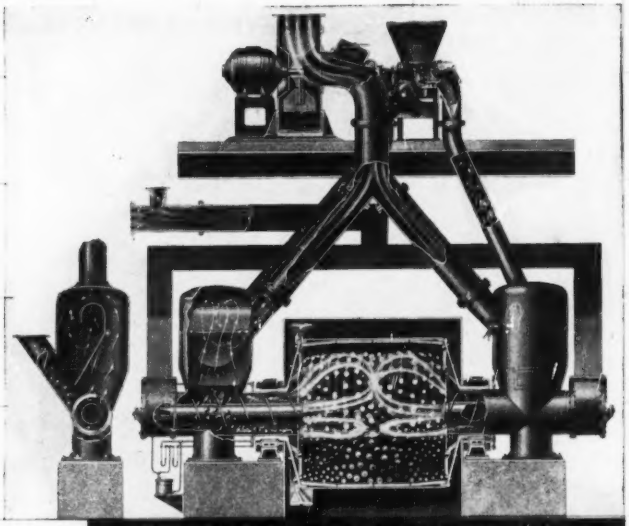
Two **Seine Twine Serves**, hard-twisted for strength, are wound over the inner jacket to reinforce the protective covering and give it added wearability.

An **Outer Jacket** of Selenium Neoprene completes the construction. During vulcanization it is fused with the inner jacket and seine twine serves to produce a single, reinforced covering that is unexcelled for protection against abrasion, corrosive chemicals, weather hazards, sunlight, heat, and flame. It is not easily cut or worn and assures safe handling.

Simplex-Tirex

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

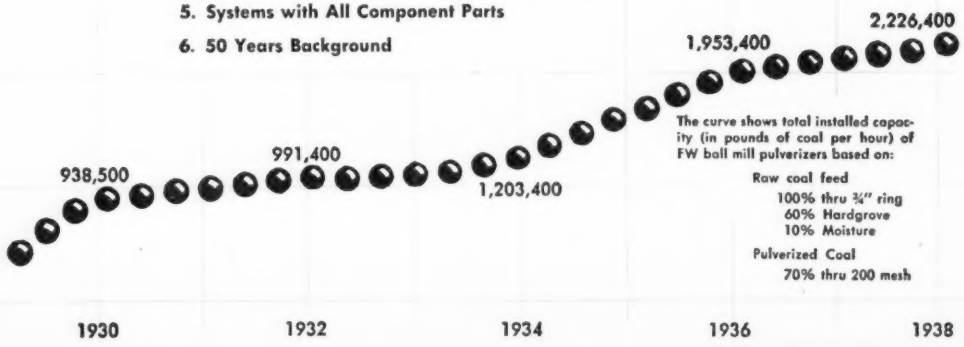
The FW Ball Mill keeps pace



The FW ball mill pulverizer provides one of the most effective methods of pulverizing hard or abrasive fuels. Its rapidly increasing use testifies to its efficiency, availability, and economy of operation.

Outstanding Features

1. Large Reserve Capacity
2. High Availability—Low Maintenance
3. Constant Fineness
4. Successful Installations for Pulverizing
   a. Anthracite Coal b. Bituminous Coal
   c. Coke Breeze d. Lignite e. Petroleum Coke
5. Systems with All Component Parts
6. 50 Years Background



The curve shows total installed capacity (in pounds of coal per hour) of FW ball mill pulverizers based on:

Raw coal feed
100% thru ¾" ring
60% Hardgrove
10% Moisture

Pulverized Coal
70% thru 200 mesh

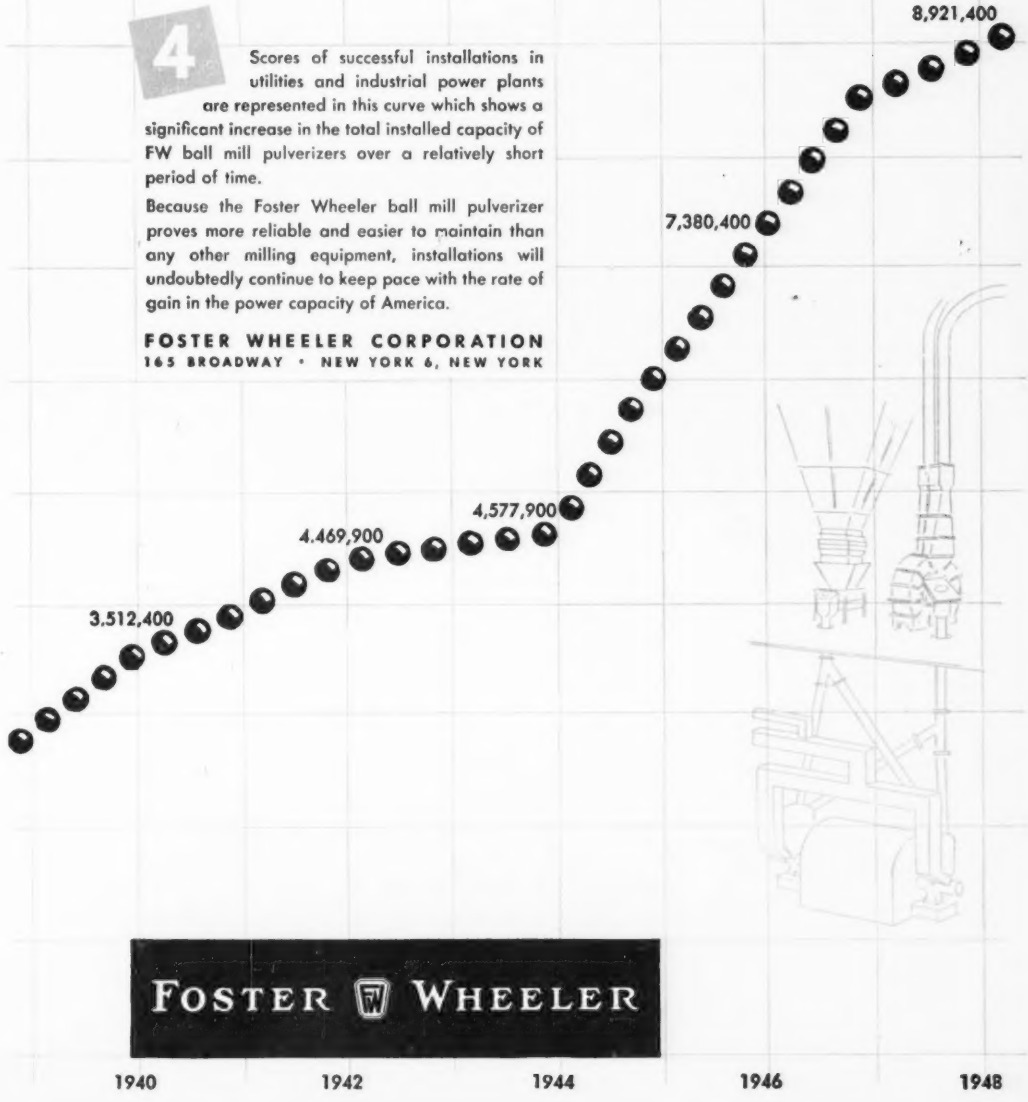
with Power Needs!

4

Scores of successful installations in utilities and industrial power plants are represented in this curve which shows a significant increase in the total installed capacity of FW ball mill pulverizers over a relatively short period of time.

Because the Foster Wheeler ball mill pulverizer proves more reliable and easier to maintain than any other milling equipment, installations will undoubtedly continue to keep pace with the rate of gain in the power capacity of America.

FOSTER WHEELER CORPORATION
165 BROADWAY • NEW YORK 6, NEW YORK



FOSTER WHEELER

Seven Fundamental Formulas For Materials Handling Calculations

A listing of formulas for horsepower and torque commonly used in calculating the performance of material handling apparatus. The data are adapted from a manual on material handling by General Electric Co, Schenectady, N. Y.

1. Horsepower to hoist a load.

$$hp = \frac{W \times fpm}{33{,}000 \times E}$$

Where:
W = weight of load hoisted in pounds
fpm = speed of load in feet per minute
1 hp = 33,000 lb-ft per minute
E = mechanical efficiency from load to motor shaft

1A. If the load is lowered instead of hoisted, the motor would be over-hauled and the friction losses between the motor shaft and the load would help hold back the load. Then the efficiency would be placed in the numerator instead of in the denominator. The regenerated horsepower at the motor would then be:

$$hp = \frac{W \times fpm \times E}{33{,}000}$$

2. Horsepower to propel a load along a horizontal plane with lineal motion, such as a crane bridge or trolley.

$$hp = \frac{W \times F \times fpm}{33{,}000 \times 2{,}000 \times E}$$

Where:
W = weight of load moved in pounds
F = friction in pounds per ton
fpm = speed of load in feet per minute
1 hp = 33,000 lb-ft per minute
E = mechanical efficiency from load to motor shaft

3. Horsepower to propel a load up a grade with lineal motion, such as an inclined hoist.

$$hp = \frac{\left(W \times \sin\theta + \left(\frac{W \times \cos\theta \times F}{2{,}000}\right)\right) \times fpm}{33{,}000 \times E}$$

Where:
W = weight of load moved in pounds
F = friction in pounds per ton
fpm = speed of load in feet per minute
1 hp = 33,000 lb-ft per minute
E = mechanical efficiency from load to motor shaft
θ = angle between horizontal and the slope up which car is to be moved

3A. If the load is moving downgrade instead of upgrade, it can be seen that the grade effect is enough greater than the effect of car friction so that the motor will be overhauled. The grade factor will therefore carry a minus sign and the efficiency factor will be in the numerator instead of in the denominator, since the friction between motor shaft and load is helping to hold the load back.

4. Torque required to accelerate a load to any given speed at a constant rate of acceleration in a given time.

$$T = \frac{WK^2 \times rpm}{308 \times t}$$

Where:
T = torque or twisting force expressed in pounds at 1-ft radius, required to produce acceleration
WK^2* = flywheel effect, or moment of inertia of the rotating body
rpm = speed in revolutions per minute
t = time in seconds required to accelerate
308 = a constant

5. Equivalent WK^2 at motor shaft of a mass having a weight W traveling at fpm when motor shaft is revolving at rpm.

$$WK^2 = \frac{W}{E}\left(\frac{fpm}{2\pi \times rpm}\right)^2$$

Where:
WK^2 = flywheel effect, or moment of inertia of the mass effective at the motor shaft
W = mass in pounds
E = mechanical efficiency
fpm = speed in feet per minute to which the mass is to be accelerated
rpm = motor speed in revolutions per minute corresponding to the fpm of the mass

6. Torque which the motor exerts when hoisting the load in equation for item 1.

$$T = \frac{hp \times 5250}{rpm}$$

Where:
T = torque in pounds at 1-ft radius
hp = horsepower to hoist load
5250 = a constant
rpm = motor speed in revolutions per minute when hoisting load at fpm

7. Equivalent WK^2 at the motor shaft of a revolving body having a given WK^2 at a given rpm.

$$\text{Equivalent } WK^2 = \frac{WK^2 \text{ body}}{E} \times \left(\frac{\text{rpm body}}{\text{rpm motor}}\right)^2$$

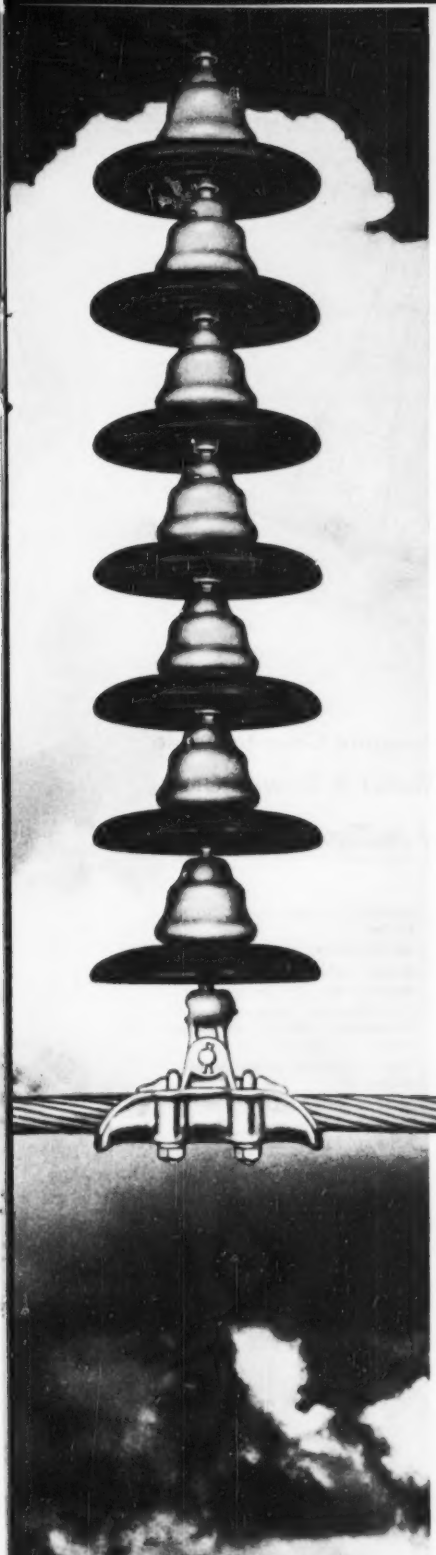
NOTES

Although the above formulas may be considered accurate, care should be exercised in applying them to conveyors, and other machines where the driven load is primarily friction.

Friction is usually difficult to predict accurately. There is a high degree of variation for any given drive, due to such factors as temperature, moisture, dust, and improper alignment.

In estimating motor sizes for high-friction loads, advice should be secured from reliable equipment manufacturers before final decisions are made.

*WK^2 has been adopted by American Standards Association (ASA) and National Electrical Manufacturers Association (NEMA) as the standard to supersede WR^2.



HI-TENSION NEWS Junior

New Cooline Hardware can pay its way

Have you asked the question, "What do I pay for O-B's new Cooline hardware?"

The answer is, "You don't—it pays you!"

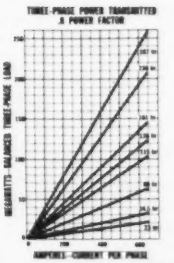
Where amperes per phase are above 200, this new hardware usually pays its extra cost over conventional ferro-magnetic designs in two or three years—its total cost in five or six.

Cooline hardware does not become heated in the electro-magnetic field of the conductor. The kilowatts required to produce this heat are available for sale at the meter; not dissipated into the air. The investment in plant machinery to generate this power is allowed to earn its normal profit.

Apply your own figures to the accompanying curves and see what Cooline hardware can do on some typical line. Roughly, this hardware will average a little less than one dollar per clamp over its ferrous equivalent. Top is a dollar-fifty. A lot of power companies, today, are looking on it as a mighty good investment. It may turn out that way for you.

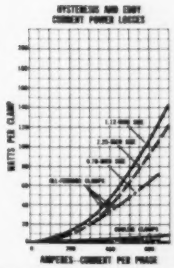
Ohio Brass

MANSFIELD, OHIO, U. S. A.



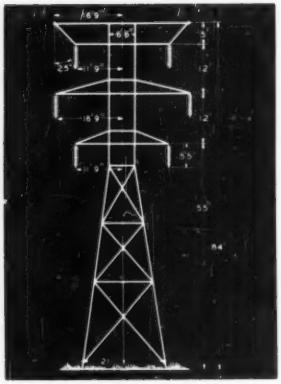
A quick conversion table to transpose balanced three-phase load in megawatts to amperes per phase. In figuring heat losses, it is necessary to know the current in each conductor.

NOTE: Savings take two principal forms. First, a direct saving in kwhr based on your cost of generation. Second, a recovery of invested capital based on the installed cost of generation equipment per kw.



Knowing your amperes per phase, this table will indicate approximate watt-loss per clamp in three typical sizes of conventional clamp designs cast in regular ferro-magnetic metals.

HI-TENSION NEWS *Junior*



Installation of Continuous Counterpoise by Shawinigan Water & Power Co.

reduces lightning outages by 93%

LOCATION OF LINE: Isle Maligne to Quebec (Lines No. 25 and No. 26)

VOLTAGE: 165 kv

LENGTH: 135.3 miles (270 circuit-miles)

YEARS OF OPERATION: 5 as described. Total age, 20 years

GENERAL DIRECTION: North-South

AVERAGE TERRAIN: Hilly. Elevation, 100 to 3000 feet above sea level.

ANNUAL STORM DAYS: 40

CONDUCTOR: 397,500 cir mils, ACSR 30/7

OVERHEAD GROUND WIRE: Two, 7/16-inch, 7-strand, crucible steel

MID-SPAN SEPARATION, GROUND WIRE TO CONDUCTOR: 20 feet, 6 inches

SUSPENSION INSULATORS: Tangent, 12 (4¾-inch). Angle and deadend, 12 (5¾-inch)

NORMAL TANGENT SPAN LENGTH: 880 feet

ARCING HORNS OR RINGS: None

TOWER FOOTING RESISTANCE: No measurements. (See footnote)

COUNTERPOISE: Continuous double counterpoise, .207-inch galvanized steel

TYPE OF SYSTEM: Solidly grounded neutral "Y"

IMPULSE INSULATION: 975 kv, 1½ x40 mu-s, positive critical

NORMAL TOTAL TIME TO CLEAR GROUND FAULT: 15 to 30 cycles (60-cycle base)

GROUND FAULT NEUTRALIZER OR PROTECTOR TUBES: None

ARC DAMAGE TO INSULATORS OR CONDUCTORS: None

AVERAGE ANNUAL LIGHTNING OUTAGES: 2.2 (per 270 circuit-miles)

AVERAGE ANNUAL LIGHTNING OUTAGES PER 100 MILES: 0.8 (per 270 circuit-miles)

FOOTNOTES: These lines went into service 20 years ago, before modern counterpoising techniques had been established. As time elapsed, it became apparent that the lines were showing a poor lightning performance record and steps were taken to remedy the trouble. Experiments were made with counterpoising, and the good results obtained dictated its complete adoption. This construction was installed without regard for existing ground resistances. Results of the counterpoise system fully came up to expectations and, since this effected a definite cure, it has never been considered necessary to make ground resistance measurements.

In their original operating condition, these lines showed an average of 11.2 lightning outages per 100 miles, per year. Installation of the continuous counterpoise brought this figure down to 2.8 outages. Later, insulator strings were increased from 10 to 12 units, and this addition of two units further reduced the outage record to its present level of 0.8.

This is one of 54 reports contained in O-B's new technical publication LIGHTNING PERFORMANCE OF TYPICAL TRANSMISSION LINES, copies of which are available on request.

Basic Impulse Insulation Level (BIL) station insulators combine a series of advantages both to the user and the manufacturer; all of which reflect to the user's ultimate benefit. BIL establishes a fully coordinated and adequate system of insulation, based on specified protective levels. This promises a definite improvement in operation. In addition, BIL reduces manufacturing variety; tooling, short runs, inventory, and shipping problems. This simplification will lead to higher production, better deliveries, and lowered costs.

Since BIL station insulator designs have evolved over a period of several years, it is entirely possible some power company purchasing specifications may not yet give them proper recognition. We urge a check of your own specifications to make sure they are in line with this modern development.

And, in buying BIL station insulators, remember this — standards establish size, shape, and technical values of a *new* insulator only. You can't specify ultimate life. But O-B's intention to build the best possible insulator can be examined in the light of over 30 years of service, and station insulator units running into the millions. With probably the most of these insulators now in service, it is significant that the bulk of present orders come from previous O-B users, and for one chief reason—satisfaction.

Be sure your purchasing specifications include BIL station insulators, and for the best of them indicate "O-B."

Ohio Brass

MANSFIELD, OHIO, U. S. A.

HI-TENSION NEWS
Junior

O-B suspension insulators *earned* this Confidence

Only one factor ruled the selection of these suspension insulators—absolute reliability! From a point 650 feet above water, six strings of 20 O-B units support each cable in this 4,800-foot crossing.

Why were O-B insulators put in this vital spot? Mere claims by a manufacturer meant nothing. It was no place for some un-tried design. But the records of the power company, covering hundreds of thousands of O-B insulators over a period of 30 years, justified the confidence so obviously placed in them.

While such applications are spectacular, the every-day use of suspension insulators carries much the same demand for reliability. The conventional insulator string on a regular tangent structure has an equal share in maintaining the continuity of power, and a sound choice of insulators is just as important.

Your best guide to this choice, however, is a case such as we illustrate here. Going to its own ample records of insulator performance, this prominent power company chose O-B suspension units for this vital place on its system. The same confidence is yours when you specify O-B.

2967-H

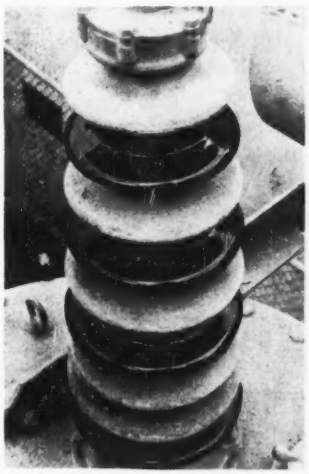
Ohio Brass

MANSFIELD, OHIO, U. S. A.

Clean Insulators With Minimum Effort

H. L. RUDOLPH
Assistant Superintendent Substations
Southern California Edison Co, Los Angeles

AN ADHESIVE COATING of clear wax can facilitate cleaning of insulators subject to severe contamination from cement dust. The cement dust, and other accumulated dirt, is easily wiped off the smooth slick surface formed by the wax on all the exposed porcelain area. Both insulators and workmen are thus spared the use of chemicals or coarse abrasives. Southern California Edison has been using this method successfully for eight years with a substantial saving in maintenance costs.



PARTIALLY CLEANED 66-kv transformer bushing was treated with clear liquid solution of paraffine wax in cleaning naphtha. Southern California Edison has used this cleaning method for the past eight years to decrease maintenance costs

CLEAR WAX COATING applied with cloth or brush facilitates cleaning contaminated insulators. Cement dust and other accumulations have been wiped from this unit without use of chemicals or coarse abrasives

Paraffine wax with a melting point of at least 130 F makes a satisfactory base. Aviation gasoline was originally used as the solvent, but cleaning naphtha is a very good substitute. The solvent must be highly volatile to make hardening of the coating as rapid as possible.

How to Prepare

Two methods have been used for making the wax solution and applying it to the insulator. First method of preparation is to shave the wax into the solvent in the proportion two pounds of wax to one gallon of solvent. The container should then be warmed enough to dissolve the wax. (Extreme caution must be used in heating the highly flammable solution.)

Second method is to place the solvent in the sun or other warm place before shaving the wax into it. This solution will congeal if allowed to cool, but will be easily liquidized by rewarming.

How to Apply

Either a cloth or a brush may be used to apply the solution to the insulator, which must first be thoroughly cleaned. Saturate the cloth in the solution and wring out the surplus. Wipe the porcelain with the saturated cloth, just as if it were dampened with any cleaning solvent.

As an alternative, the solution may be poured into buckets or cans and applied with an ordinary paint brush. A standard two inch flat brush is satisfactory in most cases. Start at the top of the stack and apply the solution freely, brushing up the surplus as in ordinary painting.

Rain or heavy fog occurring immediately after the application may wash off some of the solution not already congealed. More rapid congelation will result from increasing the wax component of the solution. Where ambient temperatures are high and temperature of the porcelain approaches the melting point of the wax, deterioration of the coating is accelerated. This calls for more frequent applications to insure coverage at all times, especially on surfaces receiving direct sunlight.

This treatment has proved satisfactory on voltages as high as 66 kv. under conditions of severe contamination. Ease in cleaning and less wear and tear on the porcelain are the result. At one location the porcelain is cleaned only once before each application every 90 days. Less time and manpower required to complete the necessary maintenance mean a substantial saving for the Edison Co.

Scheduling Pole and Line Inspection—IV*

WITH DUE CONSIDERATION to the probability of future underground construction, the line inspector is required to report all weak poles or faulty construction to the utility's joint line representative. The latter orders such action taken as he deems necessary to the safe and continuous operation of the line. The inspector examines the telephone company construction on all jointly owned poles given butt inspection. Information of this type is forwarded on forms supplied by the telephone company.

Further Duties

The line inspector checks the number of each pole listed for butt inspection against the number recorded on the pole record slip previously mentioned. He is made responsible to the joint line representative of the power company for the accuracy of such pole numbers. Another duty is to note and report any case in which the same pole number is used for more than one pole in any block or street. Again, any case in which the pole numbers are inconsistent with system standards is noted and reported. The joint line representative may order any certain few poles renumbered to conform to the company's pole plan; but no lamp pole is renumbered without a special work order.

* Continuing a five-article series which began in ELECTRICAL WORLD, Nov. 20, 1948, page 110.

While in the field the line inspector enters on the pole record slip all information called for regarding the size and kind of pole and the attached construction. This information is used by the drafting department to check maps and pole record cards. If a pole is condemned, the inspector lists the material required to replace it on the reverse side of the pole record slip. In addition to poles listed for butt examination, the line inspector is responsible to the joint line representative for the accuracy of all pole numbers recorded.

Relations with Customers. During inspection tours and on private property the line inspector is required to make himself known to any responsible person who may question him. If there is the slightest doubt as to his identity, he must exhibit his company card. He is not allowed to attempt to repair any customer's wiring, apparatus or appliance of any kind. If such repairs are requested, the inspector advises securing the services of an electrical contractor. He is not permitted to engage in unnecessary conversation regarding appliances, bills or other company business. If queried in this regard he advises the customer to consult the proper department of the company.

No city official is to be criticised, or any particular contractor recommended or criticised. However, if the customer so desires, the inspector may suggest the names of several reliable contractors about town. It is expected that the line inspector and any man working with him will avoid the use of intoxicating beverages during and just before working hours.

Layout of Inspections. The company's joint line representative lays out inspection work so that any section of the territory having overhead distribution on streets will be first covered. The remainder of the territory is covered, beginning with the part where the pole maintenance is by the power company and ending with the part where such maintenance is by the telephone company.

Poles supporting lines which are maintained by an affiliated transmission system are inspected annually in April and May regardless of location. The inspector covers the territory in the same rotation so that about 12 months will elapse between visits to any particular place.

Test No.	Test leg No. 1	Test leg No. 2	Calc. ratio	Specified turns	Coil No.
1	0.463	0.463	0.463	52	1
				85	2
2	0.895	1.037	1.037	120	3
				187	4*
3	1.263	1.263	1.263	187	5
				187	6
4	1.263	1.263	1.263	187	7
				187	8
5	1.385	1.385	1.385	205	9
				205	10
6	1.385	1.385	1.385	205	11
				205	12
7	1.385	1.385	1.385	205	13
				205	14
8	0.980	0.979	0.979	205	15
				85	16
Total	9.019	9.160	9.160		

* Coil No 4 failed. Top 42 turns burned out and bypassed. Short circuit existed only long enough to fuse turns

CALCULATED and test results for ratios of both transformer legs. (Sketch represents one of the two legs of high-voltage winding)

Ratio Test Reveals Transformer Fault

R. L. MURRAY
Equipment Engineer
Alabama Power Co
Birmingham, Ala.

How a serious transformer fault of by-passed turns can be found by a ratio test was a recent experience in checking equipment to go into service. The particular transformer involved was rated single phase, 60 cycles, 150 kva, 44,000 — 2400 v. It had previously been in service in a customer installation, was replaced only because of load growth, and was to be used in another installation.

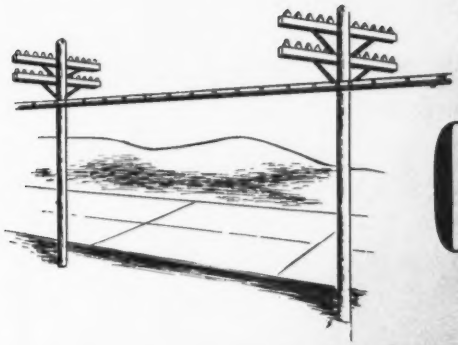
When the transformer was removed from stock and checked for serviceability, it was given a precision ratio test with a "transformer turn ratio" test set. According to the nameplate the ratio should have been 18.33 (44,000 : 2400), whereas the test showed it to be 18.18 or 99.164% of normal.

Although the ratio error was small and in ordinary testing might possibly have been overlooked, the unit was further tested by subjecting the turn-to-turn insulation to 200% voltage at 240 cycles, and the winding-to-ground insulation to 88,000 v high to ground, 10,000 v low to ground. The unit passed these tests satisfactorily.

Even though the high potential test showed the transformer to be serviceable, the tester felt that the existing ratio error may have been due to an internal fault. He requested that the unit be untanked for further investigation. Winding specifications were available which stated that there were 5424 turns in the high side and 296 turns in the low side. According to calculations based on the 0.144 ratio increment (18.324 — 18.180), there were about 42 turns missing on the primary winding, or two excess turns on the secondary, the latter being a rather remote possibility.

The transformer was the 2-legged core type with layer-wound, sectional coil, high-voltage stacks and cylindrical low-voltage coils on each leg. No defect was visible. But one leg had the correct ratio, 9.161 (22,000 : 2400 v), whereas the other leg had a ratio of 9.019 which accounted for all of the error in the overall ratio test.

Individual pairs of high-voltage coils were then ratio tested to the low-voltage winding with the results shown in the table. This step-by-step process revealed that all of the ratio error existed in one pair of high-voltage coils, i.e.: the third and fourth coils from the top of the 16-coil stack. The high-voltage coils were then removed, and the fault which was hidden under a spacer block was found in the fourth coil. The top 42 turns or four layers of this coil were burned-out and the ends fused together, thereby providing winding continuity. A short circuit had apparently occurred between turns, but existed only long enough under excitation to fuse them together, and then burned the shorted turns open leaving the fault by-passed. The defective section of the coil is shown in the illustration.



OVERHEAD

OR UNDERGROUND

Ansonia Ankoseal Power Cables have important advantages for You

Whether it must withstand the ravages of elements above or below the earth, there is a type of Ansonia Ankoseal Cable—engineered to the job—that will bring you definite advantages.

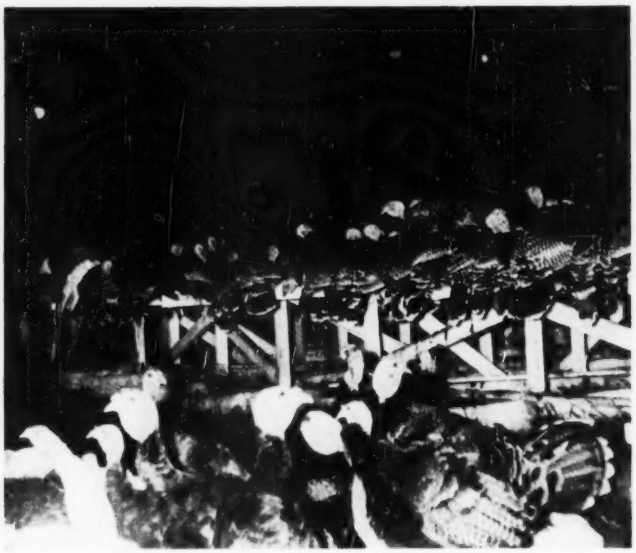
You can be the beneficiary of one or more of these conspicuous advantages—the weight-saving that can be effected; the longer service between replacements; the improved electrical properties.

These Ansonia Ankoseal benefits can be convincingly demonstrated. An Ansonia Engineer will welcome the opportunity to show what can be accomplished for you. Write, wire or phone us about your cable needs.

THE ANSONIA ELECTRICAL DIVISION
ANSONIA, CONNECTICUT *of*
NOMA ELECTRIC CORPORATION

LOAD BUILDING

Electricity Used Extensively on Turkey Ranch



TURKEYS *roost in safety from night marauders under electric lights*

COMER RENFROE
South Carolina Power Co
Charleston, S. C.

WEASELS, skunks and other night marauders with a taste for fowl keep clear of the floodlighted turkey roosts on Walworth plantation near Eutawville, South Carolina. Here, where hoop-skirted ladies and high-stocked gentlemen chatted in elegant conversation under the trees, 22,000 turkeys gobble mightily. The Walworth plantation has been turned into one of the largest turkey ranches in the Southeast. Electricity has helped greatly in the transformation, principally by protecting the birds at night.

There are four portable roost lighting systems. Each roost holds 5,000 birds and is assembled and disassembled with the ease of portable bleachers. Each has four flood lights using 300-w lamps which burn from dusk to dawn for an average of ten hours a night, nine months of the year. During January, February and March, the turkey farms in the region are stocking up with a new generation of poults.

Every six weeks, or thereabouts, the roosts and the lights are moved to a new location where range food is more plentiful. The South Carolina Power Co built half a mile of distribution line into the center of the range. The plantation electrician moves the lighting installations from place to place as required. Light, 12-ft poles are used for the line and the flood lights. These are pulled up, moved and set by a tractor with a post hole digger attachment. When in use the lights on all four ranges average 48 kwhr per day.

There are also two portable water systems, electrically operated. The movable piping runs from the well outlets to the water troughs near the roosts. Each water system has a ½-hp motor which runs an average of ten hours a day during the nine months the roosts are used, pumping 700 gal of water an hour, and using an estimated 3073 kwhr daily.

Birds Prepared Electrically

The slaughtering house, where the birds are prepared for market, is also operated electrically. The turkeys are killed painlessly and hung head down on an endless chain. They are first carried through a 20-ft vat of water heated to 145 F, electrically controlled. They then go through an electric picker which literally beats the feathers off the birds without harming the skin or the meat. Two 2-hp motors operate the belt and the picker. A 1-hp pump supplies the water. When in operation, an average of 30 days per year, the slaughtering house has a consumption of 37 kwhr per 10-hr day.

Two 5-hp motors run continuously for approximately forty days a year to operate the chilling room where the turkeys are cooled for handling and shipping. This room, with a connected load of 7.46 kw, uses 75 kwhr per operating day.

When the production process is ended and the adult birds have been sold, the plantation begins to stock up for next year's market. Turkey poults, purchased from hatcheries, are placed in electrically controlled brooders. The brooding house runs for approximately six months of the year with a 10-kw connected load.

So from dawn to dusk, from birth to death, the Walworth turkey is an "electric" bird. Total requirement of power per turkey is 34.8 kw. None of the Walworth turkeys are shipped North. All are sold to the Home Owned Stores, Inc, which operate in South Carolina and adjacent states.

POWERS GENERAL SERVICE BODIES

for versatile utility work

Twenty-four hours a day these POWERS Bodies act as mobile shops, ready to do the job anywhere. Ideal for meter and telephone installation, maintenance, emergency calls and other utility services. All-steel construction provides a dependable body that takes rough jobs in stride . . . lasts longer for greater economy. Built to flexible standards that can be arranged to suit your individual requirements. Models for ½, ¾ and 1-ton chassis. Write for complete information.

ALL-STEEL POWERS PUBLIC UTILITY BODIES

McCABE POWERS AUTO BODY CO.
5900 N. BROADWAY • ST. LOUIS 15, MO.
OVER 75 YEARS EXPERIENCE

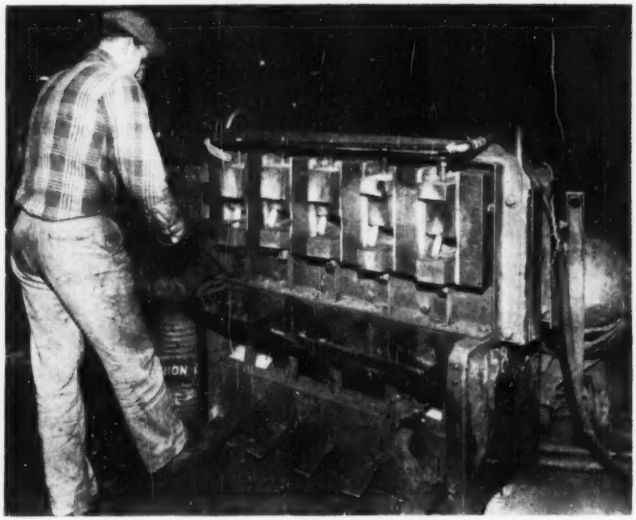
Electric Rivet Heaters Speed Fabrication

R. H. HARROD
Duquesne Light Co
Pittsburgh, Pa.

A CHANGE from fuel-fired rivet heaters to electric rivet heaters, in the Clamshell Bucket Department of the Blaw-Knox Division of the Company, Blawnox, Pa., has reduced the overall cost of heating rivets and has improved working conditions.

Overall costs have been reduced because the individual rivets are heated evenly to the required temperature in a matter of seconds. This fast heating practically eliminates scale. Early morning overtime for starting and preparing the fuel-fired furnaces has been discontinued, and rejects because of burning have been cut to a minimum. Working conditions have been greatly improved by the elimination of fumes and intense heat. The electric rivet heaters have flexibility. They can be easily moved to the work since they require only an electric connection.

The operation of the electric rivet heater is very simple. The operator merely depresses a foot pedal and places the rivet between the spring-operated electrodes. He either removes it after it has reached the desired temperature or disconnects the heater. Electricity is consumed only when the rivets are being heated. Since the only heat loss is a small amount of radiation from the rivet, the electric rivet heater gives highly economical operation.



RIVETS are heated faster, scale formation has been practically eliminated, and overall cost has been reduced by the installation of electric rivet heaters at the Blaw-Knox Co

Hugging the Ceiling

Frink Corporation Photo

SHALLOW FIXTURES, only 3 in. deep, combine the unobtrusiveness of troffers with a pleasantly lighted ceiling surface in Roberts Bros men's and boys' furnishings store in Springfield, Ill. Between the surface mounted fluorescent fixtures containing four 40-w tubes are semi-recessed incandescent down lights

Growth of Hay Drying

L. L. KOONTZ
Appalachian Electric Power Co
Bluefield, W. Va.

SHOWING the growth of hay drying on AEP lines are data compiled by the company's general supervisor of rural service.

In December, 1947, there were 182 installations. The first was made in 1940; next year one more was made. Then in successive years through 1947, the number grew rapidly—10, 19, 32, 33, 40, 46—to the total of 182 installations. Total horsepower connected in December was 1,187.5, in groups of 5 2-hp, 5 3-hp, 59 5-hp, 111 7.5-hp, 1 10-hp and 1 25-hp loads.

The predominance of the 7.5-hp size is the result of promotional emphasis based on experience and study. Of the 111 installations of 7.5-hp, it was found that 95 were made in the last four years.

IT TAKES TIME TO TELL THE DIFFERENCE

Two plastic wires may look as alike as two peas in a pod—but that doesn't mean they will act alike—through the years.

The compounding of plastics is most essential—just as in the case of rubber insulated wire.

That's why it pays to buy a make of plastic wire you can depend upon.

You can't go wrong by specifying Densheath*. This plastic insulation was pioneered by Anaconda *13 years ago*. This remarkable insulation is long-aging . . . won't burn . . . is impervious to acids, oils and alkalies. For quick, trouble-free installation, Densheath offers great resistance to abrasion . . . smooth, slick finish with no braid . . . easy fishing and clean stripping.

The Anaconda Plastic Laboratory is constantly at work to better existing insulations. It is there for *you* to use, too. And an entire Anaconda plant with the latest in equipment is ready to give you the best in service as well as product.

*Reg. U. S. Pat. Off.

FOR PLASTIC INSULATION, MAKE ANACONDA HEADQUARTERS

ANACONDA

Anaconda **Densheath** *Thermoplastic* INSULATED WIRE AND CABLE

Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

NEW EQUIPMENT

Large Lamp Luminaire

A LUMINAIRE designed to distribute light from large mercury or incandescent lamps, with a minimum of glare, has been announced by the Lighting and Rectifier Divisions of General Electric Co, Schenectady 5, N. Y.

Designated as Form 109, the unit is available in mountings which include the slip fitter type in 1¼ and 2-in. sizes. It will accommodate Type FH-1, 16,000-lumen and Type EH-1, 21,000-lumen mercury lamps in a horizontal position or the 7 and 9½-in. light-center filament lamps.

The pressed-glass reflector, spun sealed to the refractor, is hinged for relamping, with three toggle latches seating it against the hood. For top-tapped mounting, an adaptor is available which combines the luminaire with standard Form 106, 101 or 79 hoods.

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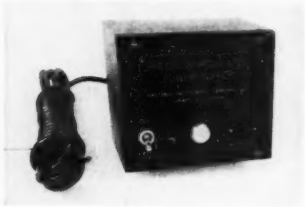


Power Supply

A D-C POWER SUPPLY, with output voltage regulation better than 0.1% and ripple less than 0.01%, is announced by the Hastings Instrument Co, Inc, Box 1275, Hampton, Virginia.

The power supply is adjusted by the manufacturer for optimum regulation at any specified load of from 5 to 30 milliamp and for any output voltage from 0 to 100 v. Regulation is thus obtained within plus or minus 0.1% for input line a-c voltages varying from 75 to 135 v, at frequencies from 50 to 400 cycles per sec.

Developed for use with instruments requiring highly stable d-c voltages, the power supply is suited for resistance thermometers, wire strain gages, position potentiometers and many other industrial and laboratory instruments. Due to its low output ripple, it may be used with all types of recording oscillographs, according to the manufacturer.

•

Oil Testing Set

TO PROVIDE MEANS for determining the condition of lubricating oil, the Gerin Corp of Red Bank, N. J., has introduced a centrifugal, oil testing kit.

The portable kit measures the four dangerous classes of contaminants: Change in viscosity due to fuel dilution or other causes; amount of asphaltic and other oil breakdown substances present; amount of dirt, metal particles, other solids and water in oil; and possibility of acid corrosion.

The manufacturer advises that even a relatively unskilled employee can analyze oil from four engines for all four classes of contaminants with a high degree of accuracy.

Load Centers

HAVING WELDED SEAMS, access plates and independent sections of heavy gauge steel, Class 8938 dust-tight control centers are a recent development of Square D Co, 4041 N. Richards St, Milwaukee 12, Wis.

Units are available with circuit breakers through 600 amp and starters through NEMA Size 5, as well as lighting transformers and panelboards. Master load and control terminal blocks are optional.

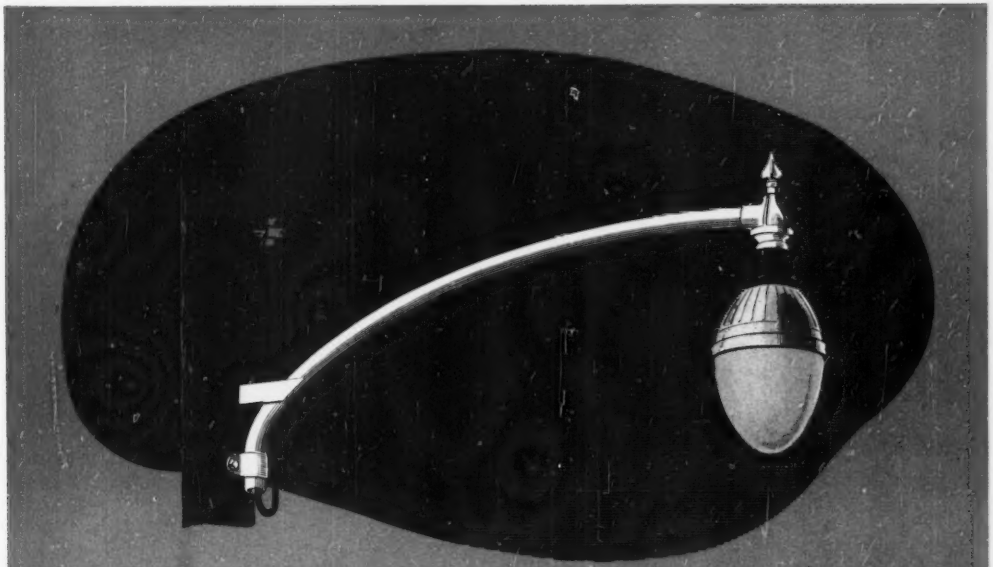
These centers may be had in NEMA enclosure Types I (general purpose), III (weather-resistant) and V (dust-tight).

•

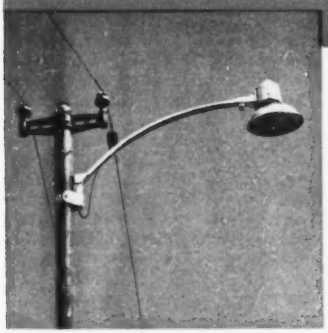
Powder Extinguisher

A DRY CHEMICAL powder extinguisher designed for use against flammable liquid and electrical fires has been developed by engineers of Walter Kidde & Co, 675 Main St, Belleville 9, N. J. Driven by carbon dioxide, a fine powder is discharged through the hose and nozzle in a stream that is said to carry 20 ft or more.

The new extinguisher, made in 20 and 30-lb capacities, contains a special dry powder mixture and is designed for one hand operation with trigger-finger control. The discharge nozzle of the extinguisher unit is engineered to give better distribution of the powder



HUBBARD ONE PIECE STREET HOOD BRACKETS

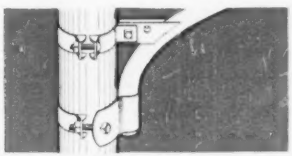


Installation on Steel Pole (See diagram)

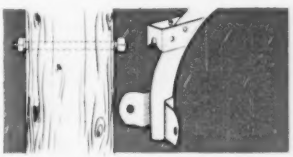
Installation on Wood Pole

ANOTHER FIRST– Hubbard, One Piece, Upsweep Brackets are a development in Street Lighting made necessary partly by the requirement for higher mounting of Luminaires, without setting new poles and without "wasting" pole space for bracket supports, and partly by a demand for greater simplicity and efficiency plus low cost. They can be mounted at the pole top if desired.

Furnished in lengths from three to six feet, these arms are all "one piece" design requiring no pole plates, braces, brace clips, insulator bushings or other fittings. They can be attached by one man. There are no sharp bends or other obstructions to hinder internal wiring. Complete data is forthcoming on these and greater lengths. Write for your copy.



Design of the Hubbard "One Piece" Street Lighting Bracket allows use on wood or steel poles merely by the application of pole bands. No change in design of the arm.



The new, exclusively Hubbard, Keyhole type (Patent applied for) of attachment above permits installation by one man.

HUBBARD AND COMPANY

PITTSBURGH CHICAGO OAKLAND, CALIF.

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Because you are interested in these active fields, you can't afford to pass up this greatest exposition of its kind ever assembled . . . the only exposition where you can see, personally inspect and compare the latest advances in heating, ventilating and air conditioning equipment and practices for all types of commercial and public buildings, industrial plants, institutions and homes. Power sales engineers and utility commercial department personnel will find here more helpful information and more profitable ideas for cultivating sales in these active fields than is available in any comparable way or time.

Don't miss this BIG opportunity—
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through a swirling action. Gravity and the force of the chemical powder stream carry the powder down to the seat of intense fires, despite rising heat currents.

•

Small Synchro Unit

A NEW SYNCHROTEL model, designed by Kollsman Instrument Division of Square D Co, 80-08 45th Ave, Elmhurst, N. Y., is said to have an electrical output increased by 500% and weight and volume decreased to $\frac{1}{3}$ of the former unit.

The new Synchrotel, having a rotor weighing only $\frac{3}{4}$ gm, functions as an inductive electrical pickoff for conditions of small driving torque and rapid oscillations. The manufacturer reports that the unit may be used in telemetering applications and with most conventional synchro systems.

•

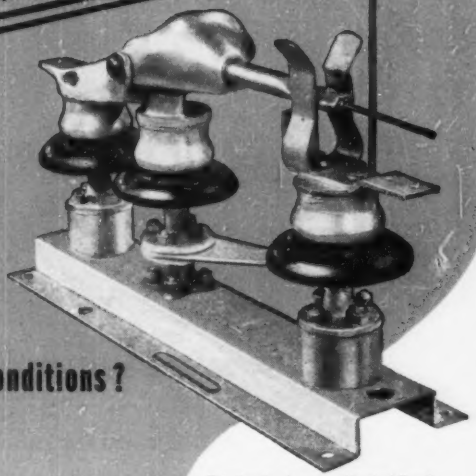
Stud Driver

A DEVELOPMENT of the Mine Safety Appliances Co, Pittsburgh, Pa., is a powder-actuated driver for quickly fastening fixtures to metal or concrete without using star drills or anchor plugs. Plain or threaded studs are driven into material by the discharge of a cartridge. Holding power of the studs is reported to be up to several thousand pounds.

Weighing only 5 lb, the tool can be

What's the Difference

...that makes Westinghouse TYPE V DISCONNECTING SWITCHES the most dependable under all operating conditions?



Rotating-Insulator . . . Vertical Break
7 1/2 to 230 kv, 400 to 2,000 amperes.

Many important differences in design and construction contribute to the matchless dependability of the Type V Disconnecting Switch. But among them are four special advantages that contribute most to the kind of performance you want.

1. **It has no shunts to corrode or break**—nothing that requires periodic replacement.
2. **Blade actuating mechanism** on live side is completely enclosed, with no exposed gears, links or levers to encourage corona formation or radio interference.
3. **Only three moving parts** on live side assure complete freedom from corrosion and ice troubles.
4. **All loaded bearings** on the live side are lubricated for life with Oilite bearings.

These advantages, in combination with smooth, completely enclosed, cam operation—only three parts move—assure positive, uniform opening and closing under all operating conditions. What's more, you enjoy this dependable, trouble-free service longer, too. Operating experience proves that Type V switches require only minimum attention to keep them in perfect operating condition for life.

For complete information on Type V Disconnecting Switches ask your Westinghouse or Westinghouse Distributor Salesman for B-3480-A. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60683

PROVED PERFORMANCE

Proved . . . at 20 below.

Proved . . . for temperature rise at rated current

Proved . . . at NEMA standard short-time ratings

Proved . . . at basic impulse insulation level

Westinghouse DISCONNECTING SWITCHES

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

KLEIN PLIERS!
. . . PREFERRED BY LINEMEN
Wherever there are linemen . . . whatever the job—tough or routine—you'll find Klein Pliers.
There's good reason for this widespread preference that began when the electrical industry was in its infancy and has continued on through the years.
Linemen know they can depend upon the quality and performance of Klein Pliers. Drop forged from the finest alloy steel, each pair is individually tempered and tested—has the proper balance—just the right spring to the handles to minimize hand fatigue. A fitted hinge keeps jaws perfectly aligned—the carefully matched knives cut swiftly, surely and stay keen for years.
The complete Klein line includes pliers for every use. Your supplier will fill your order as quickly as possible.
Ask Your Supplier
Foreign Distributor: International Standard Electric Corp., New York
A copy of the Klein Pocket Tool Guide, showing the Klein line and containing valuable tool information, will be sent on request.
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operated with one hand. The stud, with the cartridge fastened to it, is inserted in the barrel. The user rotates a spring-loaded safety arm to move the firing-pin into position. Then, with a sharp push of the barrel against the material to be penetrated, the cartridge discharges and the stud is solidly embedded.

By interchanging barrels, the tool may be adapted for use with either $\frac{3}{8}$ or $\frac{1}{4}$-in. diam studs. A variety of studs in different lengths is available, with plain heads or threaded either externally or internally.

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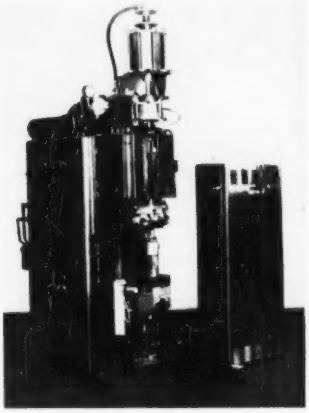
Welding Current Balancer

DESIGNED TO SUPPLY single-phase current for resistance welding, this Balanced Load 3-phase converter system places an evenly balanced, moderate



demand on a 3-phase, 60-cycle source. It is available from the Thompson Electric Welder Co, 163 Pleasant St, Lynn, Mass., for use on a 220/440 or 550-v primary source with spot, projection, seam and flash welders.

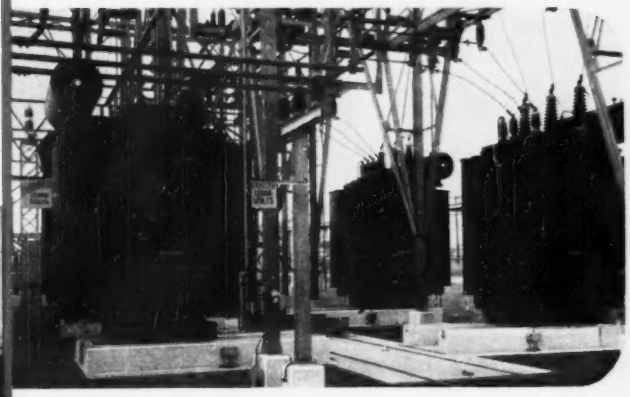
Illustrated is a Thompson 3-phase projection welder and a cabinet which contains the power converting unit, synchronous timing and sequencing controls of the Balanced Load system. The manufacturer states that existing welders may readily be adapted to use this new method of power application.

•

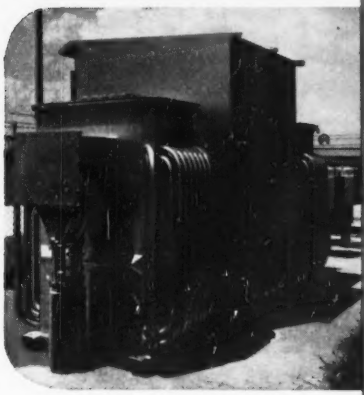
Gas Analyzer System

A NEW thermal-conductivity type gas analyzer has been combined with an electronic recorder by Bailey Meter Co, Cleveland, Ohio, to form an automatic gas analyzing and recording system. The analyzer operates on the principle

power
FOR PRODUCTION



This bank of Wagner Power Transformers is part of the main substation at the Houston, Texas Refinery of Shell Oil Company, Inc.



A Wagner Unit Substation, one of several small substations serving in the same plant.

In addition to power transformers, Wagner manufactures Rural Line, Distribution and Substation Transformers. Whatever your transformer requirements may be Wagner can furnish the exact type of transformer to fit your need.

Wagner
TRANSFORMERS
can solve your power planning problems

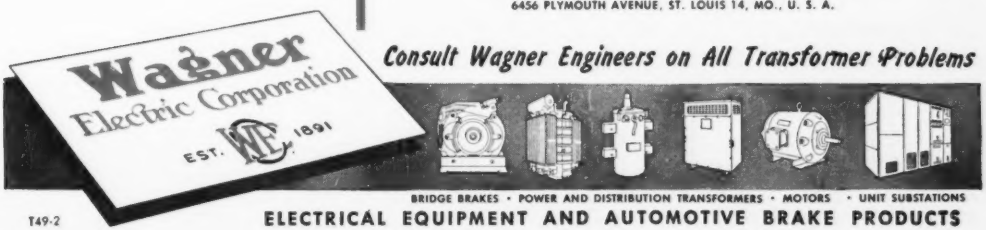
These power transformer installations, part of the recent catalytic cracking and lubricating oil plant extension at the Houston, Texas Refinery of the Shell Oil Company, are typical of Wagner Transformer installations for industrial power systems.

Wagner Power Transformers have established enviable records for continuous service in thousands of industrial plants and on transmission lines from coast to coast. Carefully controlled production methods, highest quality materials, rigid inspection and tests, and more than fifty-five years of transformer engineering experience mean that you can count on Wagner Transformers for dependable performance, plus added safety . . . added economy . . . and added service.

Users of power transformers will find it to their advantage to consult Wagner engineers on all of their transformer requirements. Wagner transformer users also profit by speedy, nationwide service facilities. Twenty-nine branch offices, manned by trained field engineers, are ready to serve you. Write for Bulletins TU-180 and TU-181 for information on the complete line of Wagner Transformers.

Wagner Electric Corporation
6456 PLYMOUTH AVENUE, ST. LOUIS 14, MO., U. S. A.

Consult Wagner Engineers on All Transformer Problems



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ELECTRICAL EQUIPMENT AND AUTOMOTIVE BRAKE PRODUCTS

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"More than Paper"

In the field of electronics and the electrical goods industry, MOSINEE stands for paper-base processing materials with scientifically controlled chemical and physical properties, high quality standards and dependable uniformity... with good dielectric strength, high tensile or tear strength; proper softness or stiffness; creped with controlled stretch or flexibility; specified pH for maximum-minimum acidity or alkalinity; accurate caliper, density, liquid repellency or absorbency . . . or other technical characteristics vital to your quality standards and production requirements.

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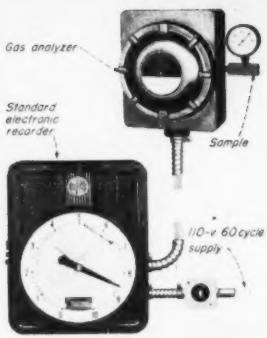


of measuring, in terms of voltage drop, the rate at which heat is conducted by the gas sample.

This instrument is mounted in an explosion-proof case and is said to be unaffected by voltage variations, ambient temperature and sample pressure variations. Employing an a-c circuit throughout, the system is further said to be unusually stable, fast in response and requires only routine maintenance.

•

Heating Units

ELECTRIC WATER HEATER UNITS, which are said to be "moisture-proofed" before shipment, have been announced by the Yale & Towne Mfg Co of Buffalo, N. Y. Built in capacities from 600 w to 5,000 w, the units are suitable for three voltage ranges: 115-120 v; 208 v; and 230-240 v.

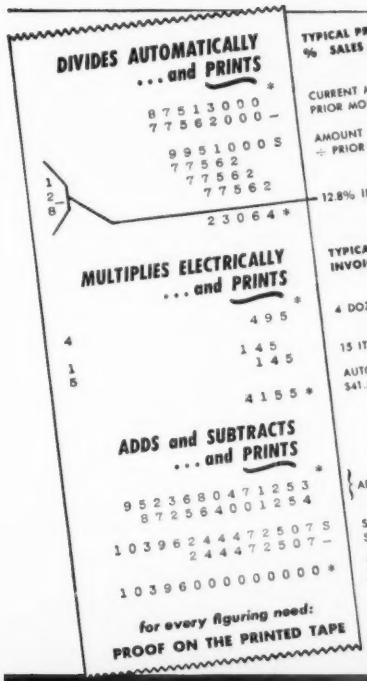
The heating units are made with single, double or triple loops, depending on wattage desired. The tubing is copper; the insulating block is glazed steatite; and the flange is forged brass. A nickel and chromium alloy is used for the heating coil, which is insulated in the sheath with magnesium oxide.

•

Abrasion Tester

FOR DETERMINING the wearing qualities of electroplated or lacquered metal parts, and surface finishes applied to insulating tapes, the Model No. 100-109 abrasion testing set has been announced by Taber Instrument Corp, 144 Goun-

"Only the Remington Rand Printing Calculator gives you printed figure facts"


DIVIDES AUTOMATICALLY
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for every figuring need:
PROOF ON THE PRINTED TAPE
TYPICAL PROBLEM:
% SALES INCREASE
CURRENT MONTH'S SALES
PRIOR MONTH'S SALES
AMOUNT OF INCREASE
÷ PRIOR SALES
12.8% INCREASE
TYPICAL PROBLEM:
INVOICING
4 DOZ. @ $4.95/DOZ.
15 ITEMS @ $1.45 EACH
AUTOMATIC TOTAL
$41.55
ADDS
SUBTOTALS
SUBTRACTS
AUTOMATIC TOTALS
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"FOOL PROOF!" you'll say of the Printing Calculator, because it automatically *prints* every factor and answer on the tape. No squinting at hard-to-read dials, no repeating problems for proof . . . a glance at the tape tells you you're right—right away! And, of course, the printed tape gives you a permanent record of the figure facts on which you base important decisions.

Whatever your figuring needs, the electrified Printing Calculator provides faster, easier, less costly operation, with 10-key touch control, "handspan" feature keys, automatic completion and clearance. And, best of all, with the printed tape, you have an electric adding-listing machine too—*two* fine machines for your one modest investment.

For the whole cost-cutting story, call your local representative, or write for free booklet "Command Performance", to Remington Rand Inc., Dept. EL-1, 315 Fourth Avenue, New York 10, N. Y.

the new **Remington Rand** *automatic Printing Calculator*

dry St, North Tonawanda, N. Y. Various standardized abrasive wheels are also available.

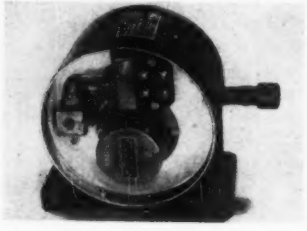
New features include a control unit equipped for operation with two abraser units, thereby permitting the simultaneous testing of two specimens using the same controls and vacuum dust collector.

•

Pressure Transmitter

ELECTRONIC TRANSMISSION of pressures up to 50,000 lb is now provided by the Microsen pressure transmitter, manufactured by Manning, Maxwell and Moore, Inc, 11 Elias St, Bridgeport, Conn. Operating on 115 v at 50–60 cycles, power consumption is said to be only two w.

Pressure motion is picked up from the tip of a Bourdon tube through an electro-mechanical relay, and is converted into a d-c signal which can be sent to milliamp instruments.



The dust and vapor-proof transmitter housing is cast aluminum, with screw-on covers. Bourdon tubes of alloy steel, bronze or stainless steel are available to meet specific service requirements.

•

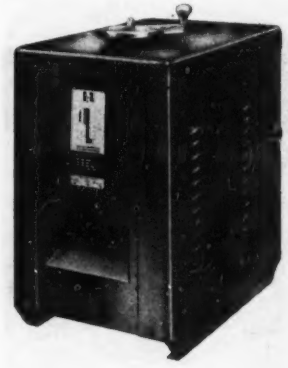
Arc Welders

A-C WELDERS featuring heavy-duty design and construction, with ratings from 100 to 2,000 amp, are produced by Glenn-Roberts Co, Inc, 2107 Adams St, Indianapolis 18, Ind.

Four "utility" models are NEMA-rated at 100, 150, and 200 amp, at 30 v, 50% duty cycle. Model 180, of limited-input type, has 180-amp rating at 25 v, 20% duty cycle.

Industrial welder line includes four models for manual welding, NEMA-rated at 200, 300, 400 and 500 amp at 40 v, 60% duty cycle; 750 and 1,000-amp single-transformer models for automatic-head welding, and 1,000 1,500 and 2,000-amp multiple-transformer models for combination manual-automatic use.

Power factor correction is standard on all industrial models and on utility Model 180; optional on other utility models. All models are equipped for dual-range output. Industrial manual



welders offer 40-v open circuit with full 80-v "push" for an easier-handling arc with high rate of deposit.

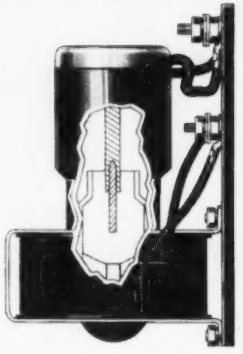
•

Mercury Relays

DESIGNED TO OPERATE on the double flow principle, "hydrogen arc-quenched" mercury type relays are made by Durakool, Inc, of Elkhart, Ind. Contacts are between two pools of mercury, in the presence of hydrogen under high pressure, to minimize arcing. Heat and corrosion, the manufacturer states, are virtually eliminated.

The relays are suitable for the switching of heavy loads in practically all fields, including highly inductive circuits such as solenoids and motors.

Characteristics of the relays include four types of action, available with normally open or closed contacts, which are: Quick operate-quick release; quick operate-slow release; slow operate-slow release; and slow operate-quick release.



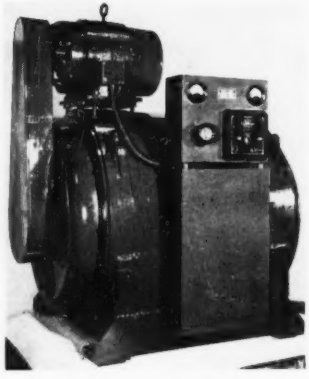
Time delays may be specified from 0.15 to 20 sec. Single unit relays are furnished in 30 or 60-amp sizes; multiple units are also available.

•

Alternators

WITH A TOP capacity of 360 kw at 1,800 rpm and 60 cycles, Katolight alternators, made by The Kato Engineering Co, Mankato, Minn., are available in speeds of 720, 900, 1,200 and 1,800 rpm. Exciters are direct connected on the high speed designs and top mounted for the low speed machines.

The alternators have such features as: all welded steel frame; rotor dampner windings; and junction cabinet to



facilitate conduit attachment, with voltage regulator control panel mounted on top.

Illustrated is a Katolight 175-kw, 60-cycle, 3-phase, 900 rpm, 480/830/960/1660 v alternator equipped with voltage regulator, ammeter, and exciter field rheostat.

It cuts down your overhead when your "OVERHEAD" cuts up!

OVERHEAD MAINTENANCE headaches are headed off when you have the right trucks for the job. *You have,* when you have Internationals working for you.

Look at the 3 ways these hard-workers help you:

1. They're right for the job!

Sure, International gives you the right trucks for overhead maintenance. But more, it gives you the right trucks for every kind of utility job. International builds a complete line from the half-ton size up. There are 22 basic International models, 1,000 different truck combinations. Gross weight ratings range from 4,400 to 90,000 pounds.

2. They're rugged!

You may not appreciate an extra margin of stamina, dependability, and ruggedness on *every* job—but you will on some! For example: you'll be mighty thankful for International's extra heavy-duty design and construction. And you'll be mighty glad that the International engine has all that power.

3. They have a service set-up to shorten "lay-up."

When utility-owned trucks are laid up, that also ties up equipment mounted on 'em. That's a double headache. And it's a big reason why you'll want to have International's service organization backing you up. Its 4,700 Dealers and company-owned Branches have the parts, the tools, the mechanics to keep your trucks as hale and hearty as the day they rolled off the assembly line.

Whenever you need any kind of trucks for any kind of maintenance or construction work remember this: International offers you a complete truck line, completely dependable, backed by America's most complete, exclusive truck service organization. For complete truck satisfaction, get in touch with your nearest International Dealer or Branch.

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CBS, Wednesday evenings

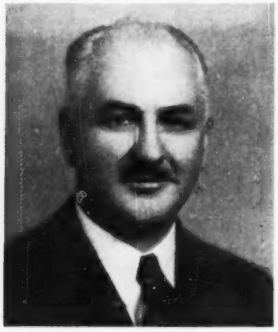
INTERNATIONAL TRUCKS

INTERNATIONAL HARVESTER COMPANY • CHICAGO

NEWS ABOUT PEOPLE

E. E. Baxter Appointed General Superintendent

E. E. Baxter, who has been serving as commercial manager of the Central Electric & Gas Co, Sioux Falls, S. D.,



E. E. BAXTER

has been appointed general superintendent of that company. Mr Baxter is succeeding E. P. Hennek, who has assumed executive duties with the Western Light & Telephone Co, Kansas City, Kans. (EW Dec 18, p. 132).

Since his employment in 1929 by the predecessor company of the Central Electric & Gas Co as superintendent of the electric and gas division, Mr Baxter held the position of district manager of the Hot Springs, S. D., electric property until he was brought back into the general office in 1937. Since that time he has been commercial manager.

Before joining Central Electric & Gas he was identified with the Iowa Public Service Co and the predecessor company for 17 years in various operating positions.

Louis Langhus has been appointed general plant superintendent of Central Electric & Gas. Continuously connected with the company and its predecessors since 1926, he has held positions as construction superintendent, district superintendent, chief engineer, and plant superintendent, the position he now holds.

•

▶ J. A. Tyvand has resigned as chief electrical engineer of the Otter Tail Power Co, Fergus Falls, Minn., to become associated with Knappen Tippetts Abbett Engineering Co, New York, in the same capacity. Mr Tyvand has been active in midwest utility work for 25 years, holding responsible engineering positions with the Wisconsin Electric Power Co, and the Wisconsin Gas & Electric Co. He was chief electrical engineer on domestic and foreign work for another New York engineering firm from 1945 to 1947.

•

Wisconsin Electric Names Wagner Sales Manager

William H. Wagner has been appointed sales manager of Wisconsin Electric Power Co, Milwaukee, succeeding I. L. Illing, who will hereafter devote more time to sales promotion and other special activities.

W. H. WAGNER

Mr Wagner became identified with Wisconsin Electric in 1931 as a sales engineer, becoming industrial sales engineer four years later. He was promoted to assistant sales manager in 1947.

•

▶ Robert Nordyke, line superintendent for Salem (Ore.) Electric, has been named manager of the cooperative to succeed the late Harry B. Read.

▶ Sam A. LaFaso has been appointed manager of public relations for the Jersey Central Power & Light Co, Asbury Park, N. J. Mr LaFaso was formerly assistant advertising manager of the New York State Electric & Gas Corp.

Shoch Elected Chairman, Interstate Power Club

Clarence T. Shoch, manager of the industrial sales department of the Pennsylvania Power & Light Co, Allentown,

C. T. SHOCH

was elected chairman of the Interstate Power Club of New York at its recent meeting.

Since joining Pennsylvania Power & Light in 1924, Mr Shoch has held a number of operating positions, including instrument man, test engineer, field engineer, plant betterment engineer, industrial sales representative, and finally manager of industrial sales department.

During a five-year period, Mr Shoch was absent from the company by permission to become electrical engineer and later engineer of plans and specifications for the Commonwealth of Pennsylvania. During a part of this period he also maintained an office as a consulting engineer.

•

▶ Earl Cole of Ostrander, Wash., has been elected chairman of the Cowlitz Public Utility District Commission, succeeding W. A. Cardwell. Mr Cole has served on the commission for two years. John Slade of Castle Rock, only remaining member of the original board, was named vice-president, and Frank Jaeger of Kalama has joined the board in the capacity of secretary.

▶ George V. Blackburn has rejoined the Central Vermont Public Service Corp as lighting engineer with head-

ELECTRICAL WORLD SAYS:

"Transformer oil purification is high in economic importance . . . because of the prospective pinch in natural oil supply . . ."

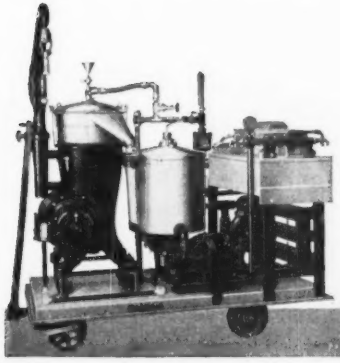
I PURIFY THIS OIL MORE SAFELY AND MORE *Economically!*

"One way to conserve oil supplies is to get full usefulness from what you have. I — De Laval Centrifugal Force —purify your insulating oil and restore its dielectric strength. I do it ***quickly*** and ***safely***.

"I do it more quickly than other means, in fact. Because my centrifugal force is virtually instantaneous, I purify insulating oil in seconds rather than minutes or even hours.

". . . More safely, too — because the water that is separated from the oil is discharged to waste. As no water collects in the bowl of a De Laval Oil Purifier, the machine operates at constant high efficiency. There is no possibility of water that has been removed recontaminating a batch of oil in the process of purification."

● ***Bulletin TR-1 describes De Laval Insulating Oil Purifiers. Send for it.***



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Bright, Clean Finish, Inside and Out
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Flat, True Contact Surface
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No Sharp Edges or Burrs

Prompt Delivery On Soldering Lugs

Yes, Sherman can solve your Lug problem. Put an end to delays and shortages, by ordering these high quality, low cost Sherman Round End Soldering Lugs.

It's easy to make strong, dependable connections with these Sherman Lugs. They are produced on precision machinery. They are acid cleaned, for easy soldering. They are individually inspected. And — they have the exclusive Sherman Closed Round End that can't leak solder.

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BATTLE CREEK, MICH.

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STOCK SIZES		
Barrel O.D.	Amp Cap.	Wire Size
5/16	25	10
3/8	35	8
9/16	50	6
5/8	70	4
7/16	90	2
1/2	125	0
9/16	150	00
5/8	175	000
11/16	225	0000
13/16	250	250,000CM

Other types and styles available

Sherman
ELECTRICAL CONNECTORS

quarters at Rutland. Leaving the company in 1942, he was employed by the U. S. Navy at Portland, Me., as an electrical engineer, and then by Chas. T. Main, Inc, Boston consultants. Since the war he has been connected with the Smithcraft Lighting Division of A. L. Smith Iron Co, Chelsea, Mass.

▶ HOWARD SCHUMAKER and FRED CRAMER have been elected president and vice-president of the Northern Light Co, Milwaukee, recently organized. The new company is continuing the fluorescent lighting fixture manufacturing business of three other Milwaukee companies, Kahn Manufacturing, Adjustable Fixture, and Fred Cramer Mfg. Key personnel has been retained, including Lawrence Kaap, chief engineer, and William Fredericks, plant manager. DON HENNINGFELD, a mechanical engineer and designer with Karl Brocken Industrial Design since 1946, has joined Northern Light engineering staff. During the war Mr Henningfeld served with the Engineer Board, Fort Belvoir, Va. Previously he supervised testing of superchargers at Allis-Chalmers.

▶ R. C. OSBORN, chief engineer for the Eureka Williams Corp, Bloomington, Ill., since 1947, has been made vice-president in charge of engineering. Before joining Eureka Williams in 1945 as chief engineer of the Eureka division, he was connected with the Hoover Co, North Canton, Ohio, and for a time served as director of engineering for the Tobe Deuschmann Corp of Canton, Mass.

▶ MARY SINGLETON, editor of *Snap Shots*, monthly news magazine of the Georgia Power Co, Atlanta, has been elected president of the Southern Industrial Editors' Association at the recent meeting. Miss Singleton has been with Georgia Power for 19 years and editor of *Snap Shots* since 1942.

▶ ROBERT H. TAYLOR has been elected president of the Florence Stove Co, Gardner, Mass., to succeed the late Edward F. Dobson. Mr Taylor, who joined the company in 1932, has been vice-president in charge of sales and a director.

▶ WILLIAM P. LEAR has been elected chairman of the board of Lear, Inc, and RICHARD MOCK has been named president. Mr Lear was formerly president and Mr Mock executive vice-president.

▶ JOHN T. SCOTT, for the past two years general manager of the Utilities Department of Etowah, Tenn., has resigned. Mr Scott joined the department in 1939.

Trumbull Electric Assigns Engineering Sales Duties

Yale T. Chaney has been appointed manager of distribution systems sales of the Trumbull Electric Mfg Co, Plainville, Conn., and William A. Edwards has been made manager of switch, breaker and control sales. George H. Sahler has been made manager of marketing research.

Mr Chaney joined Trumbull in 1937 in the engineering department of its plant in Ludlow, Ky. In 1945 he became the company's resident engineer, working with General Electric in Schenectady, N. Y.

Joining Trumbull in 1924 as a member of the advertising department in Plainville, Mr Edwards became manager of the Kansas City office in 1942 and the following year was appointed district sales manager of the south west district.

Mr Sahler was connected with GE in Schenectady as a market analyst at the time of his recent appointment. Before entering military service in 1943 he was employed in the purchasing department of E. I. Dupont.

OBITUARY

D. A. Powell

D. A. Powell, executive vice-president of the Iowa Power & Light Co, Des Moines, died in that city on Dec 19 at the age of 65. Mr Powell had been active in the operation of public utilities for more than 40 years.

Mr Powell went to the Iowa properties in 1943 from the United Light & Power Service Co, Chicago, with which he had been associated in an executive capacity. Previous connections had included the Madison (Wis.) Gas & Electric Co and what was then the San Antonio (Tex.) Public Service Co.

▶ NORMAN MACKENZIE, executive secretary of the Eastern Washington Public Utility Districts, Spokane, died on Dec 13 at the age of 53. Before going to Spokane, Mr Mackenzie headed the Colville (Wash.) Engineering Co. He was responsible for engineering work on many REA and PUD distribution lines throughout eastern Washington.

▶ WALTER E. KNOUSE, senior engineer in the electrical engineering division of the Philadelphia Electric Co, died on Dec 4. A native of Sandy Run, Pa., Mr Knouse became identified with the Philadelphia utility in 1924. After working in several branches of the electrical engineering division, he was placed in charge of transformer engi-

neering in 1942. At the time of his death he was a member of the AIEE protective devices committee and was chairman of the prize papers committee of the institute's Philadelphia section.

•

Frank H. Mason

Frank H. Mason, 69, chief engineer NEPSCO Services, Inc, died at Augusta, Me., Dec 17. In early life he was engaged in hydroelectric developments at Glens Falls, N. Y., Bangor, and Waterville, Me. In 1907 he joined the Central Maine Power Co; was its chief engineer from 1909 to 1926, and from the latter date chief engineer of the New England Public Service Co, and its affiliated engineering organization as above named.

Mr Mason had charge of the construction of numerous hydro, steam and transmission facilities in association with the late Walter S. Wyman, pioneer utility leader in Maine and adjoining states. His more recent responsibilities embraced hydro, steam, storage, mercury vapor, and gas turbine projects under active development for the utilities served by NEPSCO.

•

▶ WILLIAM MCLEAN, superintendent, electric distribution, Consolidated Gas Electric Light & Power Co of Baltimore, died suddenly at his home in that city on Dec 17. After service in World War I, Mr McLean became identified with Baltimore Consolidated as a line estimate man and served successively as assistant to the superintendent, assistant superintendent and was made superintendent, electric distribution, in 1941. Mr. McLean was a member of the transmission and distribution committee of the Edison Electric Institute and a member of AIEE.

▶ ELWOOD BACHMAN, electrical consultant for the General Electric Co in the Salt Lake City area, died on Dec 14. He was 57 years old. Mr Bachman was well-known in the construction, mining and electrical industry for his part in the electrification of Kennecott Copper operations at Bingham, Utah, one of the largest open-pit electrified mining installations in the world. Recently he was connected with the design and installation of the Utah Copper power plant. He was engineer in charge of all GE installations during the construction of Hoover Dam, and for the Geneva Steel Plant at Provo, Utah. For some 25 years he served as consulting engineer for the Hudson Bay Mining & Smelting Co, playing a major part in supervising the Flin Flon copper-zinc operation. He directed electrical construction work on the Churchill River hydro-electric plant in Canada.

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IF you need creosote for pressure-treating wood, just send an SOS to Koppers, and we'll ship your requirements. And you'll look just as happy as the man above, because you'll get the same high-quality Koppers Creosote you've always known.

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Send in your order now. And if you want to *play safe*, ask about Koppers yearly contracts that take care of your future needs.

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All Standard Specifications
For All Types of Wood Preservation

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MANUFACTURERS and MARKETS

LABOR AND MANAGEMENT at Allis-Chalmers Manufacturing Co gathered around the conference table last week to sign a new contract. Left to right are Carl Sage; Emil Polewszynski; Joe Glynn, president of Local 248 UAW-CIO at the plant; Charles Schultz (rear); Anthony Audia, international representative; Harold Neitman, Leon Venne, Roman Meid, Douglas Bennett and Clem Nagel, all representing 248; and Joseph Biebel, Joseph Lennart, Harry Ladwig (rear), E. F. Orman, chairman of the company negotiating committee; John Waddleton, Joseph Dean (rear), F. Worley, K. C. Flory and H. Rass, all company representatives

NEMA President Looks for Good Business in '49

The world-wide demand for products of the electrical manufacturing industry, the long-range expansion program of American electric utilities, and the high activity in residential, industrial, commercial and public construction promise to continue the high level of business for electrical manufacturers probably for several years to come and certainly through 1949. Next year will probably be as good for most electrical product lines as 1948—the largest volume year in the industry's history.

This forecast was made by B. W. Clark, president of the National Electrical Manufacturers Association, in a year-end statement.

The Westinghouse vice-president qualified his prediction by saying, "Actual 1949 accomplishments will depend considerably on the steel and copper supply and on industrial peace in mining, transportation, and manufacturing. For example, a labor disturbance that would reduce the supply of copper for a month might cost output of electrical products that could never be recovered during 1949. Steel has been and apparently will be even more critical than copper. Dislocation of supply could seriously affect production of electrical equipment and appliances."

Reynolds Metals Co has announced that record shipments of more than 428,500,000 lb of aluminum were made during 1948. In 1947, the total was about 400,000,000 lb.

"In order to do everything possible to alleviate the metal shortage," R. S. Reynolds, chairman of the board, asserted, "Reynolds in 1948 paid excessive power costs ranging up to 10¢ per pound of aluminum produced. . . . Insufficient power is seen as the only limitation on peak capacity production levels for 1949. We hope to get power sufficient to place in operation the two idle pot lines at Jones Mills, Ark., as well as to operate the 380,000,000 lb of available capacity in our several reduction plants."

•

Water Heater Booklet

With the purpose of making accurate information as widely available as possible, the Electric Water Heater Section of the National Electrical Manufacturers Association has issued a booklet, "The Modern Automatic Electric Water Heater." The opening pages, entitled "What It Is," contain illustrations indicative of the water heaters' characteristics—clean, automatic, safe, and economical. "How It Operates," the second part, by means of tables and diagrams, describes electric water heating as a method.

A-C, Local 248 Contract Signed for West Allis

A new contract was signed on Dec 20 by Allis-Chalmers Manufacturing Co and Local 248 of the UAW-CIO, covering the West Allis works production employees.

Under its terms, more than 3,600 workers out of 11,000 will receive wage increases totaling $234,500 during the coming year. These are a result of an acceleration of the automatic wage progression based on length of service with A-C, and are in addition to the 8% placed in effect by the company several months ago. The company's normal program of merit increases continues without change.

Among other things, the new contract provides a no-strike pledge, a grievance procedure, an impartial referee procedure for questions of interpretations and violations of the contract, and a supervised strike vote before any strike after the contract's expiration.

The contract, which replaces an interim agreement reached between the two parties last July, expires June 1, 1949, with a 30-day automatic extension clause.

•

Corrosion-Resistant Fan Incorporated in Motors

General Electric tri-clad totally enclosed, fan-cooled motors are now available in popular sizes from one to 20 hp, equipped with a newly developed corrosion-resistant Textolite cooling fan. The incorporation of this new fan in these standard, highly corrosion-resistant cast iron motors now makes them specially desirable for use in corrosive atmospheres. In addition, since the fan is non-sparking, it has also been incorporated in GE totally enclosed motors designed for use in hazardous gas or dust locations.

•

Cable Plant for Australia

Paper-insulated power cables will be made in Australia by a joint subsidiary of British Insulated Callender's Cables Ltd and Metal Manufacturers Ltd, an

Australian company. Cables of this type have not been manufactured previously in Australia. The new company will meet the entire Australian demand except in the supertension field.

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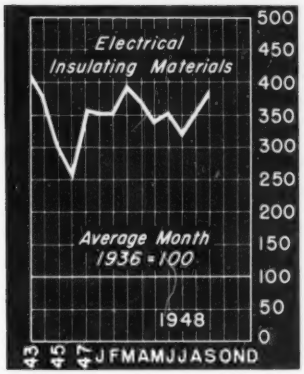
Insulating Materials Sales Rose 9% in September

Sales billed on electrical insulating materials during the month of September, 1948, moved upward, according to



figures released by the National Electrical Manufacturers Association. The index compiled by NEMA advanced to 387 from 354 in August, an increase of 9%.

In September, 1947, the index stood at 350, the 1948 figure representing an increase of 11%.

•

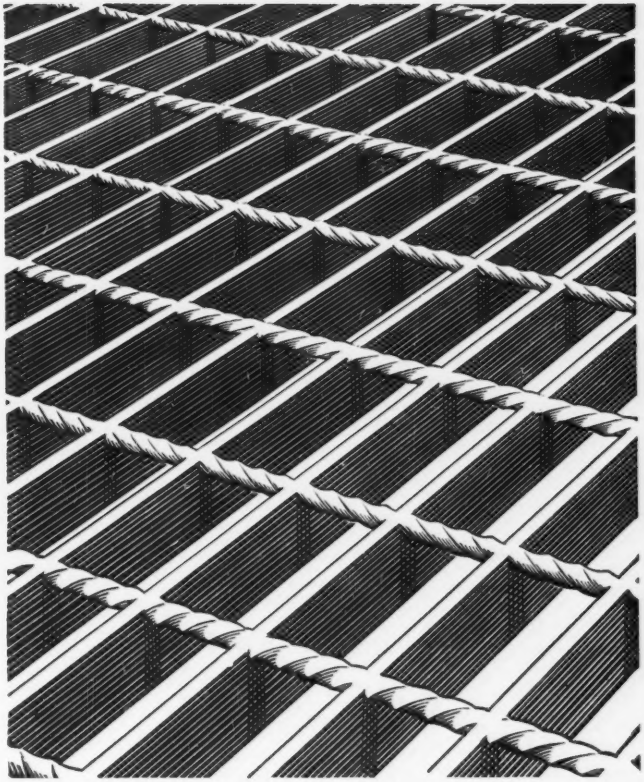
Reopens Buffalo Office

The Crocker-Wheeler Electric Manufacturing Co, division of the Joshua Hendy Corp, Ampere, N. J., has reopened its Buffalo branch office in the Ellicott Square Building. The new Buffalo branch, operating directly under the New York district manager, is headed by Louis E. Rau. Mr Rau goes to Buffalo after several years on the staff of the New York district office.

•

Proctor to Offer Trade-In

Proctor Electric Co will embark on a merchandising campaign for the first quarter of 1949 which will feature a $2.00 trade-in on its $12.95 Champion iron and a $3.00 trade-in on its $18.95 Color-Guard toaster. This trade-in promotion is being made possible, according to Robert M. Oliver, vice-president in charge of sales, because the appliance industry is back to a prewar norm. A $1.00 trade-in allowance on irons was a familiar promotion tool before the war, but toaster trade-ins were uncommon.



SEE THOSE TWISTED CROSS-BARS?

They're electroforged directly *into* the bearing bars to form a rigid one-piece steel "material" of guaranteed strength—with safe footing at all times . . . Blaw-Knox Grating also—

★ *Provides Maximum Open Area* for light and ventilation

★ *Is Easy to Maintain* . . . easy to paint thoroughly

★ *Is Self-Cleaning*—no sharp angles to retain debris

★ *Economical to Install* in any size or shape

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So that you can have a "close-up" of Blaw-Knox Grating construction, write today for this "paper-weight-size sample" on your business letterhead.

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BLAW-KNOX ELECTROFORGED STEEL GRATING

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Stenciling Is Too Costly Today

Public Utilities Are Now Adopting Premax Aluminum Letters and Figures For Permanent Identification

Cost less to install—will outlast the average pole! Get full details and prices of Premax Stamped and Embossed Letters, Figures and Marking Tags for public utility lines.

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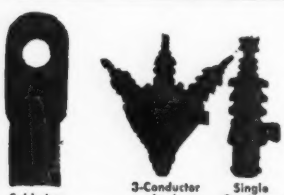

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NEW ELECTRICAL CONSTRUCTION

A weekly selection of U. S. electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is indicated or implied

UTILITIES

Proposed Construction

Ala., Athens—City, 44 mi. electric power lines. Plans deposit $25. Ladd Eng. Co., 209 Wood Bldg., Ft. Payne, engr.

Arizona-Nevada—Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, Colo., furnishing del. f.o.b. cars shipping point or f.o.b. cars Tucson, Ariz., one 20,000 kva. 13,800 volt, 3 phase, 60 cycle, hydrogen-cooled, outdoor type synchronous condenser with control equip. for Tucson substation, Davis Dam Proj., Spec. 2507. L. N. McClellan, ch. engr.

Arkansas—Farmers Electric Co-operative Corp., Newport, 70 mi. rural distr. line, sys. imprvs., incl. 11 mi. tie line and completing previously approved constr., Jackson Co. **$295,000.**

Colorado—Bureau Reclamation, Dpt. Interior, Bldg. 1A, Denver Federal Center, Denver, 1,500 kva. substation at Fleming, Colorado-Big Thompson Proj., Spec. 2505. L. N. McClellan, ch. engr.

Georgia—Lamar Electric Membership Corp., Barnesville, 300 mi. rural distr. line, sys. imprvs., 4 mi. tie lines, 2-way radio communication sys. and completion present headquarters facilities, Lamar Co. **$480,000.**

Ga., Fitzgerald—The Fitzgerald Ice Co., Fitzgerald, ice plant and cold storage warehouse. **$150,000.**

Ind., Bloomington—Indiana University, J. A. Franklin, Administration Bldg., brick, rein.-con. power house imprvs., alterations, incl. 2 water tube boilers, chain link or traveling grate stoker, turbo-generator units, steam condensing plant. $600,000. Ammerman, Davis & Stout, 912-23 Indiana Pythian Bldg., Indianapolis, mech. engrs.

Kentucky—Green River Rural Electric Co-operative Corp., Owensboro, 385 mi. rural distr. lines, sys. imprvs., Daviess Co., **$820,000.**

North Dakota—R. S. R. Electric Co-operative, Milner, 533 mi. rural distr. lines, sys. imprvs. completing previously approved contr., Sargent Co. **$920,000.**

Oklahoma—Cotton Electric Co-operative, Walters, 244 mi. rural distr. lines, sys. imprvs., 95 mi. tie lines, two-way radio communication sys., completing previously approved constr., Cotton Co. **$1,250,000.**

Oregon—U. S. Eng., Pittock Block, Portland, 2 generators, Detroit Dam. $2,000,000-$3,000,000.

South Carolina—U. S. Eng., Post Office Bldg., Savannah, Ga., design, manufacture, deliver, f.o.b. railroad cars at Uchee, S. C. from 4 to 7 units, hydraulic turbines and governors for Clark Hill Dam, Inv. No. Eng-09-133-49-76. $400,000-$600,000 per unit.

South Carolina—Lynch River Electric Co-operative, Pageland, 150 mi. rural distr. line, sys. imprvs. and headquarters facilities, Lancaster Co. **$370,000.**

Tennessee—Tri-County Electric Membership Corp., Lafayette, 796 mi. rural distr. lines, sys. imprvs., 54 mi. tie lines, and headquarters facilities, Macon Co. **$1,770,000.**

Tennessee—Fort Loudon Electric Co-operative, Madisonville, 170 mi. rural distr. lines, sys. imprvs., 14 mi. tie lines, two-way radio communication sys., completing previously approved constr., Loudon Co. **$840,000.**

Texas—Pedernales Electric Co-operative, Inc., Johnson City, 609 mi. rural distr. lines, 68 mi. tie lines, sys. imprvs., Blanco Co. **$1,330,000.**

Texas—Deaf Smith County Electric Co-operative, Hereford, 287 mi. rural distr. lines, sys. imprvs. and two-way radio communication sys., Deaf Smith Co. **$760,000.**

Tex., Bryan—City, Noah W. Dansby, secy., steam power plant. $1,250,000. Plans deposit $100. Freese, Nichols & Turner, 2111 National Standard Bldg., Houston, engrs.

Washington—U. S. Eng., Walla Walla, main turbines and governors, Ice Harbor Powerhouse, Snake River. $3,000,000-$5,000,000.

Washington—U. S. Eng., Walla Walla, main generators, Ice Harbor Powerhouse, Snake River. $3,000,000-$5,000,000.

Wisconsin—Grant Electric Co-operative, Lancaster, 80 mi. rural distr. lines, sys. imprvs., two-way radio communication sys., headquarters facilities and for completed constr. with prior REA approval incl. 22 mi. rural distr. line, Grant Co. **$295,000.**

Wis., Milwaukee—WISN, 123 W. Michigan St., remodel for radio station, air-conditioning. Plans deposit $25. Grassold & Johnson, 734 N. Jefferson St.; Zone 2, archts.

Low Bidders & Contracts Awarded

Arkansas—U. S. Eng., 300 Broadway, Little Rock, furnishing, del. power transformers for Bull Shoal Dam, White River, Inv. No. Eng-03-050-49-17, from Pennsylvania Transformer Co., 808 Ridge Ave., Pittsburgh, Pa., **$445,130.**

Minn., Duluth—Minnesota Power & Light Co., foot of 50 Ave. W. and Main St., generating plant addn., to Kileen & Wille Constr. Co., 1404 Poplar Ave., Approx. **$375,000.**

New York—Triborough Bridge & Tunnel Auth., 10 State St., New York, Zone 4, electric work for Brooklyn-Battery Tunnel, Contr. BBT-12, to Fischback & Moore, Inc., 226 E. 41 St., New York, Zone 17, **$1,292,000.** Bids 11/4.

Pa., Phila.—Phila. Electric Co., 900 Sansom St., electric transformer substation, separate contracts, **$118,000.**

South Dakota—U. S. Eng., 1709 Jackson St., Omaha, Neb., Dec. 17, tunnels Fort Randall Dam, Eng-25-066-49-103, from Silas Mason Co., Shreveport, La., **$8,585,808*****stilling basin and power house sub-structure, from McCarthy Imprvt. Co., Portsmouth, O., **$10,977,856*****intake structures, from Steenberg & Assoc., Rapid City, S. D., **$21,556,342*****complete project, from Hunkin-Conkey Constr. Co., 1740 E. 12 St., Cleveland, O. **$36,699,395.**

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

N. J., Weehawken—Neo-Gravure Corp., 601 W. 26 St., New York, N. Y., plans by DeCherrie & Berkenhilt, engrs. and archts., 82 W. Washington St., Chicago 2, Ill., 1 and 2 story, 315x500 ft., steel, brick, rein.-con. printing plant, incl. press room, bindery, paper warehouse etching photo and art departments, general offices, boiler room, etc. **$1,500,000.**

S. C., Charleston—Worth Agency, Inc., (agent) 90 Broad St., plans by Bissett, Carlisle & Wolfe, Columbia, S. C., 14 story apartment. **$2,000,000.**

Tex., Port Arthur—Gulf Oil Corp., Port Arthur, polyform refinery unit, near here, **$4,500,000;** desulphurization refinery unit, **$6,000,000.**

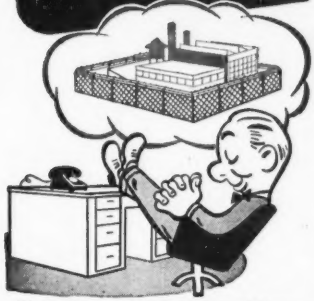
Low Bidders & Contracts Awarded

N. Y., New York—100 Park Ave., Inc., Louis Adler, pres., 125 Park Ave., Zone 17, 36 story office bldg., Park Ave. between 40 and 41 Sts., on site of old Murray Hill Hotel, to George A. Fuller Co., 597 Madison Ave., Zone 22. Est. **$20,000,000.**

Tex., Dallas—Merchandise Mart, Inc., c/o Joe B. Salmon, pres. National Industries Corp., Republic Bank Bldg., 10 story, bsmnt., 200x400 ft. masonry merchandise mart, incl. 1,000 auto storage area, 15 high speed elevators, to George P. O'Rourke Constr. Co., 1001 W. Commerce St., Approx. **$7,000,000.** Est. $6,500,000. R. A. McGarry, 904 Fort Worth Ave., engr.

Utah, Garfield—Kennecott Copper Corp., Kearns Bldg., Salt Lake City, electrolytic-copper refinery, to Utah Constr. Co., 57 E. 4 South St., Salt Lake City. Total est. **$16,000,000.**

You can relax when your property is fenced by STEWART



No need to lose any sleep over vandals molesting your industrial property when it's surrounded by a Stewart Chain Link Wire Fence. fence framework makes it the heaviest and The All Beam construction of the Stewart strongest chain link wire fence manufactured. A Stewart Fence will give you the utmost in protection, and many years of dependable, low cost service. Write for Catalog No. 83.

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1666 Stewart Block Cincinnati 1, Ohio
Experts in Metal Fabrications since 1886

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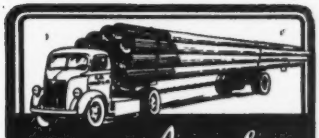

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Truck Shipments
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R. G. HALEY & CO., Inc.
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TOLEDO 4, OHIO

RECENT RATE CHANGES

INDIANA & MICHIGAN ELECTRIC CO and the municipal City Light Utilities in Fort Wayne, Ind., have been granted higher electrical rates for water heater and combination water heater and range users. Under the new rates the only change is the fixing of a definite number of kwhr per month for water heating at the present one-cent rate, with all electricity used for other purposes in excess of 180 kwhr per month billed at 1½ cents. The rate adjustment does not change the rates for the first two blocks of 60 and 120 kwhr each per month. Indiana & Michigan expected additional revenues of $11,200 a year, affecting approximately 1,611 of the company's water heater customers, while the city light said the new schedule would net the board approximately $5,000 more a year, affecting about 1,000 customers.

OHIO PUBLIC SERVICE CO has announced an increase of about 9% in electric power rates in Port Clinton, effective Jan 3. The rate increase was included in the terms of a new franchise granted the utility by the city council.

●

A-C Analyzer for India

An a-c network analyzer for installation at the Indian Institute of Science, Bangalore, India, is under construction at the General Electric Co's Philadelphia Works. When completed early this year the instrument will be installed in a newly-built laboratory.

●

Raytheon Subs Move

New York offices of the following divisions and subsidiaries of Raytheon Manufacturing Co are now located at 50 Broadway, New York: Equipment Sales Division, International Division, Russell Electric Co and Submarine Signal Co. Raytheon's publicity department and Broadcast Equipment Sales remain at 60 East 42nd St. The New York office of Belmont Radio Corp is at 521 Fifth Avenue.

●

Forms Painting Company

Announcement has been made of the organization of the Electrical Utility Painting Co at 1020 East Linden, Richmond Heights, Mo., by U. C. Dunaway, formerly division superintendent of Richardson Paint Co. The new company will specialize in the painting of transmission towers, substations, and power plants. Mr Dunaway was associated for many years with the James R. Kearney Corp as head of high-line tool engineering and earlier had been superintendent of transmission and distribution for the Kansas City Power & Light Co, Kansas Division.

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quarter of a century—
SERVING THE UTILITIES

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Test Blocks • Test Switches • Special Switches • Test Tables • Safety Blocks • Meter Enclosures • Meter Connection Units • Reactiformers • Transformer Enclosures • Accessories

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON 1, OHIO
A subsidiary of the Union Metal Manufacturing Co.

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Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

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Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation. Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 344, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr. — Chicago, Ill.

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Specializing in
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to those intent upon good quality

2 East End Avenue at 79th St., New York 21, N. Y.

ELECTRICAL UTILITY PAINTING CO.

U. C. Dunaway, Pres.
Specialists in painting of
TRANSMISSION TOWERS
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1020 E. Linden, Richmond Heights, Mo.

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Expert advice on location and purchase of right of way.
Industrial plant layouts and surveys. Rate comparisons.

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CATALOGS • BULLETINS

● ELECTRODES: Bulletin 68, covering resistance welding electrodes and alloys, lists properties, applications, classifications and specifications. Ampco Metal Inc, 1745 S. 38th St, Milwaukee 4, Wis.

● INDICATOR: Catalog 4620 outlines the construction and application and carries connections for "Hipot" potential indicator. Roller-Smith Division, Bethlehem, Pa.

● LINE TOOLS: Bulletin 471 presents descriptions, specifications and illustrations of winches, pole trailers and derricks, cable splicers carts, pintle hooks, power take-offs, earth boring machines, line bodies and a line of construction and maintenance trucks. Eagle Division, Four Wheel Drive Auto Co, 414 East Winnebago St, Appleton, Wis.

● MOTORS: Bulletin 51B6052J entitled *Handy Guide for Quick Selection of Electric Motors* provides specifications and application data for squirrel-cage induction motors, speed-torque curves on synchronous, wound-rotor and d-c motors, and selection chart for 1 to 200-hp induction motors; also chart of motor controls. Allis-Chalmers Mfg Co, Milwaukee 1, Wis.

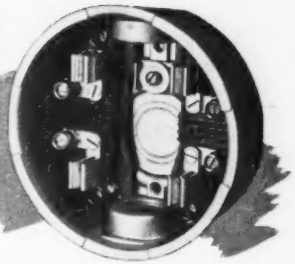
● REFLECTOSCOPE: Bulletin 3001 describes operation of type SR05 Supersonic Reflectoscope and outlines applications for locating internal defects in metals and other materials. Sperry Products Inc, 1505 Willow Ave., Hoboken, N. J.

● DISCONNECT SWITCHES: Catalog 114 describes construction and operation, and lists specifications for type SW and SWA outdoor group-operated, vertical break, tilting-insulator switches in ratings 7.5, 15, 23 and 34.5 kv, 400 and 600 amp, 46 kv, 600 amp. Pacific Electric Mfg Corp, 5815 Third St, San Francisco 24, Calif.

● LIGHTING: To illustrate effective use of planning lighting by means of Plan-O-Lite, a packet is available containing problems, solutions, data and layout prints on commercial lighting installation. The Frink Corp, 2701 Bridge Plaza North, Long Island City, N. Y.

NEW STANDARDIZED DEEP METER SOCKET

Low price plus these advantages...



1. Additional wiring space for more liberally rated conductors
2. Greater ease of connecting larger conductors
3. Increased current-carrying capacity
4. New and improved all-welded, one-piece, stainless steel ring
5. Snap-action, quick-hitch ring that requires no tools for installation
6. Bonderized plus baked-on aluminum paint for increased corrosion resistance and longer life
7. Two-way ($3.00 list) three-way ($3.85 list), subject to change without notice.

This new type R-1 four-terminal standardized socket covers with one catalog item the widest practicable range of applications and ratings for single-phase metering. It reduces the number of items to be stocked, increases interchangeability, and provides for future growth.

Detailed specifications and prices are available from your nearest G.E. representative. Consult him today, or write for Bulletin GEA-5147. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

901-43

STAR INSULATING BEADS

Use LAVOLAIN ball and socket beads for insulating bare wire. Heat resistant. High di-electric and mechanical strength. Made in U.S.A. Quality beads at low cost. Quickly applied. Flexible. Beads shown above are approximately half actual size. Ask for price list and samples.

STAR PORCELAIN CO.
51 Muirhead Ave. Trenton, N. J.

ALL the strength and durability inherent in steel are combined—with definite economies—in *Crapo* Galvanized Steel Strand. Heavy, ductile, tightly-bonded zinc coatings, applied by the famous *Crapo* Galvanizing Process, provide lasting protection against corrosion.

Ask the distributor of *Crapo* Galvanized Products near you or write direct for further information!

INDIANA STEEL & WIRE CO.
MUNCIE INDIANA

ALL ALUMINUM

COMDUIT RODS

STRONG . . . LIGHTWEIGHT . . . EASY TO WORK WITH . . . TIGHT-LOCKING . . . NO MALE AND FEMALE JOINTS . . . EACH COUPLER IDENTICAL . . . *WRITE TODAY FOR DETAILS AND PRICES.*

ABBOTT & MATHEWSON, INC.
Box 149, Niagara Square Station, Buffalo, 1, N. Y.

Rate Simplification

(Continued from page 46)

of reporters who regularly covered public utility matters and were familiar with regulatory procedure. Letters were also sent to all Company employees, informing them of the reasons for the rate raise.

The residential rates first filed produced an increase of 43¢ a month for the 150-kwhr system average bill. The weekly equivalent was used in a slogan of "10¢ a Week for the Average Washington Home" and found to be extremely effective as a public relations tool. The newspapers picked it up and used it over and over, even though the figure was lowered to 7.4¢ by the rates finally approved.

Letters were sent to each of the 32,000 commercial customers explaining the rate changes. As a result, some one hundred inquiries were received, practically none of which were complaints about the increase in rates. A few customers sought advice on how they could change their operation to reduce their bill, but the general tenor was "How much is *my* bill going to be increased?"

The weather man threw in a small monkey wrench with a storm that broke about the time the rate increase was announced. Service outage due to the storm apparently inspired complaints from three customers.

Supplementing the letters, calls were made by Commercial Department Engineers on some one-hundred-odd large customers to explain the new rates and answer inquiries. At the conclusion of these calls, the Commercial Engineer reported ". . . and in no case was an unfavorable reaction to the new rates encountered".

Estimate of Changeover

In the later stages of the preparation of the new rates, an estimate was made of the effect of commercial customers shifting from one schedule to another. When the new rates were ordered into effect, meter books were scanned to insure proper schedule, and borderline cases were computed.

A check and tickler system is being set up to double-check and maintain proper schedule for commercial customers, and to handle inquiries from customers regarding their proper schedule. While there is considerable activity at present in handling customers' inquiries, it is expected to diminish with proper scheduling.

Protests against the rate increase were made through the press by a few citizens' associations and a progressive political party. Witnesses for three labor organizations and a representative of apartment house operators who were faced with rent control problems, were, however, the only protesting appearances at the public hearing. In fact, one citizens' association sent a witness to record its appreciation of the Company's position and its prior approval of the Commission's resultant findings as being just and equitable.

Sliding Scale Plan

On February 20, 1948, the Public Utilities Commission of the District of Columbia prescribed a Modified Sliding Scale Plan for use in the regulation of the Company's rates. The Plan, through the media of a deferred credit account and a special income adjustment account, is designed to provide a means of regulating the income of the Company during and for any calendar year by way of withholding income, or releasing income previously withheld. Under the Plan, the Company will be permitted to retain one-half of the amount by which its operating income exceeds the amount of the basic return (5½% of the rate base); the remaining half of the excess is to be applied as refunds to customers or as additions to the deferred credit account pursuant to a formula prescribed in the Plan.

By and large, the consumer public was most understanding towards the rate boost. The new sliding scale arrangement, together with a long history of annual rate reductions and a policy of "keeping the public informed", was undoubtedly responsible for the favorable public acceptance. In the case of the commercial customers, the adoption of a set of rates simple enough for all to understand went a long way toward softening the blow of what otherwise might have seemed just another dip into their pocketbooks. It also demonstrates the importance and practicability of making rate changes consistent with existing conditions rather than to absorb revenue changes by following previous rate patterns.

Although rate increases cannot be made painless, an objective approach, a little housecleaning and a careful selling job can make them a much less bitter pill to swallow.

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(Classified Advertising)

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Business : : Used or Resale

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$1.20 a line, minimum 4 lines.
To figure advance payment count 5 average words as a line.

Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices count as one line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

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Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $9.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

MECHANICAL ENGINEERS
For Positions of
Project and Senior Engineers
Steam Power Plant and/or Gas Plant Experience Preferred. Ideal Community—Close to Metropolitan Areas. Write to
Mechanical Engineer
PENNSYLVANIA POWER & LIGHT CO.
Allentown, Pa.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

WANTED: GRADUATE Electrical Engineer with experience in operation of Substations, Metering, Relays and Protective Devices. Five to ten years operation experience is necessary. Must have pleasing personality, be able to work with other departments. Location in southern states. Inquiry will be treated strictly confidential. Please state age, experience, salary expected. P 7498, Electrical World.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (39 years recognized standing and reputation). The procedure is highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present positions protected. Send only name and address for details. R. W. Bixby, Inc., 262 Dun Bldg., Buffalo 2, N. Y.

SALARIED PERSONNEL $3,000-$25,000. This confidential service, established 1927 is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

POSITIONS WANTED

GRADUATE ELECTRICAL Engineer, fifteen years experience in operating department of electric utilities; five years in supervisory capacity desires position as substation or meter engineer. PW 7499, Electrical World.

ELECTRICAL GRADUATE available. Age 35. Eleven years experience including G.E. Test course, factory and utility distribution design, and six years electrical sales. PW 7444, Electrical World.

Wanted
Design Engineer

Experienced in design and detailing of electric power substations. Duties consist of layout and detail design of substations, including steel structures and checking detail drawings. Salary open.

Write B. C. BOHANNON,
Personnel Director,
SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA,
Give full details in the first letter.

METER SUPERINTENDENT

To supervise Meter Department including central shops and laboratory for rapidly growing utility with 300,000 meters. Permanent position and excellent opportunity. Reply giving age, education and experience. All replies confidential.

P-7414, Electrical World
330 West 42nd Street, New York 18, N. Y.

Need a Florida Representative?

After March 1, 1949 my principal headquarters will be at 124 S. W. First Ave., Delray Beach, Florida. My plans include serving as Field Sales Representative for a small group of non-competing lines, preferably sold to personnel of Transmission and Distribution Depts. of Operating Electric Utilities, with whom I am well acquainted from personal contacts spread over nearly 20 years; and perhaps also distributed through jobbers. Special assignments and warehousing service that might require formation of a sales and service organization, might be included.

My current work terminates during Jan. 1949 after more than 20 years as Sales Mgr., Pole Hardware Dept., Malleable Iron Fittings Co., Branford, Conn. During this period there was a 14-fold increase in business of this Dept. in dollars, or a 7-fold increase in tonnage. My contribution included designing, patenting, and modifying for quantity production of Malleable Castings Specialties constituting the bulk of the business.

My previous experience includes, in reverse order, the following work: as N. Y. Mgr., *Electric Light & Power*, Business Dept.; similar work with *Electrical Review* and associated publications; as Sales Mgr., Kleinschmidt Electric Co., component of present Teletype Corp.; Asst. Business Mgr., *Electrical World*; Mgr. Claims Dept., General Motors Co., and Asst. Treasurer of subsidiary Ohio automobile production plant; Engineer with U. S. Engineer Office, War Dept. on maintenance of N. Y. Harbor Forts; and starting as graduate Electrical Engr. from Columbia University. This breadth of experience should assure adequate representation for any concern contemplating expansion of business in Florida along the lines indicated. *Address:*

Freeman W. Kennedy
43 Aubrey Road,
Upper Montclair, N. J.

WANTED
Design Engineer

Experienced in design and detailing of electric switch-gear. Duties consist of preparing layout and shop detail drawings. Salary open.

Write Personnel Director
SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA
Giving full details in the first letter.

TURBO GENERATORS

TURBINE OF THE MONTH
1—450 KW—Whse 250 lbs. ISP., Surface Condenser, Auxiliaries, 3 ph. 60 cy. 440 Volt. Direct Conn. Exciter. Built 1944.

1—5000 KW 6250 KVA, G.E. 3600 RPM 175/200 lbs. I.S.P., 100° S.H. Condensing 3 ph. 60 cy. 2300/4000v. Surface Cond. & Aux.
1—2000 KW G.E. 6600v, 3 ph., 60 cy. with 175 lb. cond. turbine and dir conn. exciter
1—1500 KW G.E. 2300v, 3 ph., 60 cy. with G.E. 225 lbs cond. turbine, surface condenser
2—1250 KW G.E. 2300v, 3 ph., 60 cy. with 175 lbs. condensing turbine
1—1250 KW Al Ch. 2300v, 3 ph., 60 cy. with 200 lb. condensing turbine, surface condenser
1—1000 KW G.E. 2300/4150v, 3 ph., 60 cy. with 135/150 lb. condensing turbine

BELYEA COMPANY INC.
51 Howell St. Jersey City 6, N. J.
Phone—Journal Square 2-3334
ALSO N. Y. CITY LINE—RECTOR 2-7150

FOR SALE

1—AC Generator, G. E. Co. Type ATB-2, 1250 KVA, Form T, Amp. 314, Speed 3600 RPM, .8P.F. 60 cycles, 2300 volts.
1—G. E. Co. "Curtiss" Steam Turbine #22141, 1000 KW, 3600 RPM, Form A, 3 Stage, 250# gauge steam pressure, condensing.
All in good condition. The above turbo-generator will be taken out of service on or about February 1, 1949 and can be inspected under load in the meantime.
Bids will be accepted up to Noon January 17, 1949 for the purchase of this equipment, based upon delivery on blocks outside the Municipal Electric Plant.
For further details or to arrange inspection, contact Borough Manager, Quakertown, Pa.

WANTED
ENGINEER FOR RATE WORK

Large combination electric and gas utility system wants engineer, with electric utility experience, to specialize in rate work, service cost analyses and associated subjects. Permanent position. Age approximately 30 to 35. Send details of education and experience, to:

P-7207, Electrical World
520 North Michigan Ave., Chicago 11, Ill.

Power Equipment

Released by Utilities & Industrials

Turbines, Generators, Steam and Oil Engines, Boilers, Motor Generators, Rotaries, Transformers, Motors, Compressors, Induction Voltage Regulators, Oil Circuit Breakers, etc.

Service backed by 40 years' experience

BREW, WOLTMAN & CO.
52 Church St., New York 7, N. Y.

MG SETS FOR SALE

Driving Motors—2300 - 3 PH - 60

No. 1—West. MG Set, SYN, 720 H.P.—600 RPM, 2—300 KW, 600 V. Gen. with GE Automatic Switchgear
No. 2 and 3—Each GE MG Set, Ind. 750 H.P.—714 RPM 500 KW GEN. 1200 volt with GE Automatic Switchgear.
No. 4—GE MG set, Ind., 450 H.P.—720 RPM —300 KW.—1200 volt manual switchgear.

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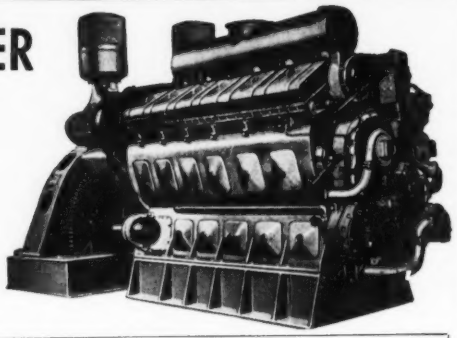
Electrical and Mechanical Engineers
145 ERIE STREET
San Francisco 3, California
TEL. HE-1-7313 HE-1-7158

DIESEL ELECTRIC POWER

FOR

IMMEDIATE DELIVERY

UNIT CAPACITIES—10 TO 1420 KVA
A.C.—50 AND 60 CYCLES
ANY VOLTAGE



A PARTIAL LIST OF OUR INVENTORY

KVA	Make	Model	HP	RPM	KVA	Make	Model	HP	RPM
1420	Fairbanks Morse	38D8⅛	1600	720	375	Enterprise	DSG-6	450	450
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
1000	General Motors	12-278A	1200	720	300	Fairbanks Morse	YVA	360	257
900	General Motors	12-567	1100	720	125	General Motors	3-268A	150	1200
625	Superior	OS	750	327	75	General Motors	6043C	90	1200
425	Baldwin	VO-6	510	450	62	Int'l Harvester	UD-18	76	1200

WRITE FOR COMPLETE INFORMATION

Engineered AGSCO DIESEL POWER

A. G. SCHOONMAKER Company, Inc.

ESTABLISHED 1898

Diesel Engines • Power Machinery

ENGINE DIVISION, 50 CHURCH STREET, NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

1606 53rd ST. NORTH BERGEN, N. J. N.Y.C. Tel. LOngacre 5-3227 N. J. Tel. UNion 3-2600

MOTOR SQ. CAGE

1—150 HP.—Ridgeway 900 rpm 2200v.
1—125 HP. G.E., 1800 rpm 2300v.
1—100 HP. Whse, 1800 rpm 440v.
1—100 HP. Whse, 1200 rpm 2200-440v.
1—75 HP. Whse. CS. 1200 rpm. 2200 volts, 3 phase, 60 cycle.
1—75 HP. 1800 rpm Westinghouse, 440 volt.
1—75 HP General Electric Type KT 900 RPM 440 volt.
2—40 HP. G.E., 900 rpm. 220v.

MOTORS SLIP RING

1—2500 HP G.E. MT 257 RPM 6600 volt
2—150 HP G.E. Type IM 450 RPM 440 volt.
1—100 HP G.E. Type IM 400 RPM 440 volt.
1—100 HP. G.E. 720 rpm 440v, 25 cy. IM.
75 HP. G.E. 1200 rpm 220v, 60 cy. Vert.
60 HP. West. 900 rpm 2200v, 60 cy. Vert.
50 HP. F.&M. 1800 rpm 220v, 60 cy.

MOTORS—D. C. 230 VOLTS

1—125 HP. G.E. 1800 rpm R.t.
1—75 HP. 865 rpm General Electric.
1—50 HP. 700 rpm. Crocker-Wheeler.

VARIABLE SPEED 220 VOLTS

1—35 HP. 300/1200 rpm Westinghouse.
1—30 HP. 440/1200 rpm General Electric.
2—25 HP. 650-2200 rpm Westinghouse.
2—25 HP. 500-900 rpm Electric Dynamic.
1—35 HP. 500/1500 rpm General Electric.

MOTOR GEN. SETS

1—1000 KW General Electric 600 volt 514 RPM 4000 Volt Syn.
1—500 KW. G.E. 250v 900 rpm 2300v Syn.
1—500 KW. G.E. 575v 900 rpm 2300v Syn.
1—125 KW. Crocker Wheeler 1200 rpm 125v Generator 2200v S.C. Motor.
1—100 KW. Elect. Mach. 1200 rpm 125v Generator 4150 Syn. Motor.

PLATING GENERATORS

1—1½ KW. G.E. 5-6v with sq. cage mt.
1—12 KW. Hansen Van Winkle 24v 1200 rpm. 20 HP. General Electric KF Motor.
1—3000 Amp. Chandeysson, 6-12v 400 rpm 8vn. Motor.
1—2500 Amp. ditto.
1—625 KVA West. Reduction Gear Turbo Generator Non-Condensing, 2400v 3 ph 60 cy.

TRANSFORMERS

1—1000 KVA, G.E. Auto 4600-2300 volt.
3—333 KVA, West. 2400 volt 240/480 fourteen
3—300 KVA Pitts. 2300v. pri. 115/230v sec.
1—300 KVA G.E. type H 2300v pri. 115/230v sec.
1—150 KVA West. 2300 volt Pri. 240/480 sec.
1—150 KVA G.E. 2300v 110-220v.
2—100 KVA type SK, 13,200v primary 250v, secondary single phase.
10—27½ KVA G.E. 1 ph. brand new 440/220v 220-110v.

ALTERNATORS & SYNCH. MOTORS

1—2500 KVA Westinghouse, Syn. condenser, 720 rpm 2200v with D.C. exciter.
1—220 KVA Allis Chalmers, 450 rpm 480v.
1—240 KVA General Electric ATB, 600 rpm 240v with D.C. exciter.
1—225 KVA 514 rpm 600v Westinghouse.
4—200-100 HP. Whse. 720/360 rpm 4150v.
1—200 HP General Electric 257 RPM 440 volt.
1—165 KW. 514 rpm 2200v Electric Machinery.
1—100 HP. G.E. type TS 600 rpm 4400v D.C.
1—1700 HP. Westinghouse 300 rpm 2400v.

Complete Line of A.C. and D.C. Motors and Generators

ELECTRICAL CABLE

BOUGHT AND SOLD

★ For every industrial and power application
★ LARGE STOCKS ON HAND
★ RAPID DELIVERY
★ CUT TO LENGTH

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UNIVERSAL Wire & Cable Co.
2662 No. Clybourn Ave., Chicago 14, Ill.

CONSULT US FOR HARD-TO-FIND EQUIPMENT

Diesel Gasoline and Steam Generators, Electrical and Industrial Equipment

POWERITE CORPORATION
140 Cedar St. New York 6, N. Y.
BA 7-8199

FOR SALE — TRANSFORMERS

Line Hardware and Secondary Power Equip.

3—667 KVA G.E. Transformers, out door, single phase, 60 cycle, 33000 V. primary—440 V. secondary, type H, form KD. Also line hardware, secondary power equipment, 3 phase Buss runs, 500000 CM wire, etc. New and never used.

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Baltimore 31, Maryland

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We Rebuild in accordance with N.I.S.A. Standards

D. C. MOTORS

Qu.	HP	Make	Type	Volts	Speed
6	1500	Whse.		525	600
1	1200	Whse.		600	525/700
1	700	G.E.	MCF	600	150/525
1	650	G.E.	MFC	230	115/145
2	600	G.E.	MFC	600	600/720
1	335	Whse.	MQ	230	300/900
1	200/300	G.E.	MFC	220	360/920
1	275	Whse.	QM-600.8	230	425/850
1	250	G.E.	MFC	230	400/800
1	230	Al. Ch.		230	700
3	150	Whse.	SK-200	230	600
1	150	Cr. Wh.	CMC-65H	230	1150
1	150	G.E.	MFC	230	230/450
1	150	Cr. Wh.	152HL	230	300/1050
8	150	Cr. Wh.	TEFC-87H	230	890
1	150	G.E.	CD-B-Brg.	600	250/750
2	125	G.E.	CO	230	625
1	125	El. Dy.	308	230	750/1560
1	115	Cr. Wh.	JHL	230	1200
1	100	G.E.	MFC	230	225/450
3	100	Whse.	SK-Vert.	230	485/950
2	100	Rel.	1050T	230	400/1200
1	80	El. Dy.	308	230	475/950
3	75	Cr. Wh.	53H-TEFC	230	860
1	75	Whse.	SK-180	125	650
1	75	G.E.	Sprague C	230	500/1000
2	75	G.E.	CDM-1126Y	230	2000

TURBO GENERATOR SETS

See ad on page 103

TRANSFORMERS (60 cycle)

Qu.	Kva.	Make	Phase	Type	Voltages
4	1250	G.E.	1	HVDDJ	6600/550
1	600	Al. Ch.	3	H	2300/216
1	300	Pitts.	3	OISC	4150/120/208
10	15	Whis.	1	YR (AIR)	450/117

MOTOR GENERATOR SETS

3 Ph. 60 Cycle

Qu	KW	Make	Speed	DC Volts	AC Volts
1	1800	G.E.	600	125/250	4000
1	1500	G.E.	360	275	2200/4400
1	1500	G.E.	600	600	4150
1	1500	Whse.	600	600	4150
1	1250	G.E.	600	275	2300/4150
1	1000	Whse.	514	250	4000
1	1000	Whse.	514	600	4000
1	800	Al. Ch.	720	500	2300/4000
1	750	Cr. Wh.	720	250	2300/4160
1	500	G.E.	720	125	2300/4150
1	500	G.E.	720	600	4400
2	400	G.E.	720	250	440/2300
1	400	G.E.	1200	120/240	440
1	350	G.E.	900	125	4150
1	250	Whse.	1200	240	440
1	150	Cr. Wh.	1200	250	220/440
1	100	G.E.	1170	125	220/440
1	100	G.E.	1200	250	2200

ROTARY CONVERTERS (60 cycle)

Qu.	KW	Make	Speed	DC Volts	AC Volts
1	2000	G.E.	514	600	13200
1	2000	G.E.	450	600	13200
1	1000	Whse.	900	600	11000
1	750	Whse.	900	600	13200
1	500	Whse.	900	250	6600

All units can be furnished with AC and DC Control.

SYNCHRONOUS CONDENSERS

Qu.	KVA	Make	Type	Volts	Speed
1	5140	Whse.		4150	600
1	4000	G.E.	TSC	2400/4150	900
1	3000	Whse.		2400	720
1	3000	G.E.	ATI	4800	720

A. C. MOTORS—3 Ph. 60 Cycle

Synchronous

Qu.	HP	Make	Type	Volts	Speed
2	2500	G.E.	TS	2300	257
1	2100	G.E.	ATI	4800	514
2	2000	Whse.		2200	120
1	1000	Whse.	MILL	2300	189.5
2	900	Al. Ch.	Eng. (New)	2200	150
1	600	Whse.		440	360
1	500	G.E.	ATI	480	900
2	500	G.E.	TS-9832	4160	600
1	450	Whse.		2200	128.5
2	350	G.E.	TS	2200	150
1	325	Whse.		440	900
1	320	G.E.	ATI	2300	600
1	308	Al. Ch.		440	600
1	300	G.E.	ATI	440	720
1	300	Whse.	Enc.	2300	720

Slip Ring

1	1000	Whse.	CW	2300	705
2	700	Whse.	CW	2200	900
2	500	G.E.	IP	550	805
3	450	G.E.	IM	440	505
1	400	G.E.	IM	2200	252
3	350	Whse.	CW	2200	900
1	350	G.E.	MT-442y	4000/2300	257
1	300	Al. Ch.	ANY	2300	505
1	250	G.E.	MT	4000	257
1	250	G.E.	MT-559S	2200	1750
1	250	G.E.	MT-563y	550	900
1	135	G.E.	IM	2300	700
2	100	G.E.	IM-16	2200	435

Squirrel Cage

1	250	G.E.	KT-559	440	1750
1	250	G.E.	IK	2200	600
1	200	G.E.	KT-557	440	1800
1	200	G.E.	IK	550	865
1	125	(New) G.E.	KF TEFC	440	1190
1	115	G.E.	KT-6325L	440	3585
2	100	G.E.	KT-543	220/440	1750

Every Machine Is Owned Outright by Us

RENU BILT BELYEA MOTORS

Belyea COMPANY, INC.

MAIN OFFICE AND SHOP
51 HOWELL ST., JERSEY CITY, N. J.

What are your needs?
UNITS UP TO 5000 KW
AVAILABLE IN STOCK

TRANSFORMERS FOR SALE

3— 3 KVA W-H 13200-120/240
12— 5 KVA W-H 13200-120/240
4— 10 KVA W-H 13200-120/240
3— 25 KVA W-H 13200-120/240
3— 25 KVA Mol 13200-120/240
10—37½ KVA W-H 13200-120/240
2— 25 KVA W-H 13200-2400
2—37½ KVA Mol 13200-2400/4160Y
3— 75 KVA W-H 13200-120/240
3— 75 KVA G-E 13200-120/240
1— 75 KVA Mol 13200-2400
1— 100 KVA W-H 13200-2400
10— 1½ KVA Wag 7200-120/240 "REA"
4— 5 KVA W-H 2400/4800-120/240
4— 7½ KVA W-H 4800/8320Y-120/240
3— 50 KVA W-H 4800/8320Y-120/240
3— 50 KVA G-E 26400-2300/4000Y
3— 50 KVA G-E 33000-2400/4160Y
3— 100 KVA G-E 33000-2400/4160Y
1—Gas Fired Recirculating Young Bros. DRYING OVEN, 2 Compts. complete with controls.

TRANSFORMERS WANTED

Rewind and repair service on all makes of transformers.

THE ELECTRIC SERVICE CO.
Cincinnati 27, Ohio

DIESEL ELECTRIC POWER

for

IMMEDIATE DELIVERY

A PARTIAL LISTING OF OUR INVENTORY
ALL ITEMS NEW OR RECONDITIONED

Generator Sets:

H.P.	MAKE	FUEL	KW	RPM	GEN.	PH.	CYL.	VOLTS
510	Cooper-Bessemer	Diesel*	350	900	PM	3	60	2400
112	Caterpillar	Diesel	75	900	AC	3	60	220/440
90	Buda	Diesel	50	1200	Smith	3	60	220/440
56	Buda	Diesel	30	1800	Century	3	60	220/440
50	Cummins	Diesel	28	1200	EM	3	60	120/208
56	LeRoi	Gas**	25	1200	West	3	60	120/208
65	Hercules	Gas	25	1800	Masters	3	60	120/208
32	Buda	Gas	7.5	1200	Kato	3	60	120/208

Oil Transformers:

KVA	MAKE	PRIMARY	SECONDARY	PH.	CYL.
125	GE	2400	240/480	1	60
150	Penn	2400	120/240	1	60
200	Penn	2400	120/240	1	60

* This unit can also be furnished as Gas-Diesel
** This unit can also be furnished as Natural Gas or Butane

WRITE FOR COMPLETE INFORMATION

Dept. B **EVERSON SUPPLY COMPANY**
15712 S. Leahy Ave. *Phone Torrey 7-3514* BELLFLOWER, CALIF.

FOR SALE
Used D.C. Watthour Meters
G.E. Type C6

IVAN T. JOHNSON CO., INC.
95 Madison Ave. N. Y. 16, N. Y.

SYN. MOTOR

360 R.P.M. 225 H.P. Electric Machinery 2300 Volt three phase three bearing Synchronous Motor with starting panel and two belt driven Exciters.

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550' 2—conductor 500,000 c.m. 37 strands 6/64" wall varnished cambric cable, fill tape
serve
1—.025" x 2" bright steel Condex tape serve jute tarred overall.

NELSON ELECTRIC SUPPLY CO.
Tulsa, Oklahoma

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Plus a New Section

A prediction for the Industry's Coming Years. Electrical World cooperates with manufacturers and industry associates to present a composite forecast for 1949, 1950 and beyond.

One of the year's most significant and useful publications in all industry. More important this year than ever.

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the 75th Anniversary Edition

coming May 21 will be Electrical World's most important milestone in 75 years of serving the Electric Power Industry

NOW... Selective tripping accomplished more effectively, more dependably with direct-acting

I-T-E SELECTIVE OVERCURRENT TRIP DEVICE ⊖

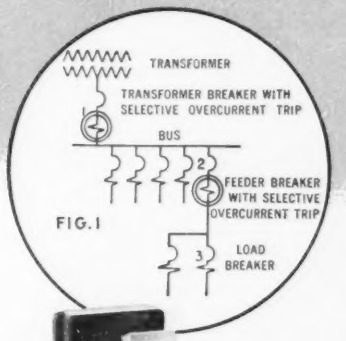
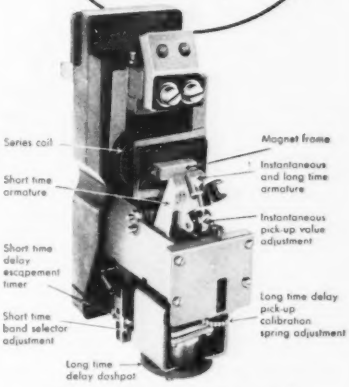


FIG. 1

SELECTIVE TRIPPING is a scheme for applying circuit breakers in series, so that fault currents in a distribution system are interrupted only by the breaker *closest to the fault*. Through Selective Tripping, maximum continuity of service is maintained after interruption of a feeder-fault.

Now, through the use of I-T-E's *direct-acting* Selective Overcurrent Trip Device, originated by I-T-E engineers, Selective Tripping has reached a new high in effectiveness and dependability. Through its direct action, the Device is more reliable because it eliminates the need for control circuits and costly auxiliary control equipment. Being mounted right on the breaker, it is space-saving, readily accessible, and economical to maintain.

If you are planning the installation or modernization of any industrial or central station electrical distribution system, it will pay you to investigate the possibilities of a Selective Tripping scheme utilizing I-T-E Air Circuit Breakers with the exclusive I-T-E Selective Overcurrent Trip Device. The I-T-E representative in your locality will be glad to assist and advise you. We will furnish names and details of prominent Selective Tripping installations using I-T-E equipment upon request.


Series coil
Short time armature
Short time delay escapement timer
Short time band selector adjustment
Long time delay dashpot
Magnet frame
Instantaneous and long time armature
Instantaneous pick-up value adjustment
Long time delay pick-up calibration spring adjustment
I-T-E SELECTIVE OVERCURRENT TRIP DEVICE ⊖
(Elementary type used for purposes of operation explanation only)

TYPICAL OPERATION

This device operates through a series coil with two clapper-type armatures mounted side by side. One armature is connected to a long-time delay and has a pick-up point of 80–160%. This long-time armature is connected to its timer through a calibrated spring which permits instantaneous tripping when the current reaches a predetermined value above 1200%. The second armature is connected to a short-time delay escapement mechanism, and has a pick-up value of 800–1200% of the rated coil current. In operation, both armatures start moving at the current values for which they are calibrated. Thus, if the current is above instantaneous value, both timers start moving, but precedence in tripping is obtained by the instantaneous armature due to the yield of the calibrated spring. If the current is in the short-time range, both armatures move, but the short-time armature trips the breaker before the long-time armature has moved very much. The difference in the short-time tripping ranges of the breakers in the system is so arranged that the breaker farthest from the source of power trips first.

For a complete technical explanation of Selective Tripping, write for Bulletin 4802, SELECTIVE TRIPPING OF LOW VOLTAGE AIR CIRCUIT BREAKERS.

R&IE *

LOW VOLTAGE SWITCHGEAR

The Leader In Technical Excellence

I-T-E CIRCUIT BREAKER COMPANY, 19th & HAMILTON STREETS, PHILADELPHIA 30, PA.

31 OFFICES IN UNITED STATES • In Canada, EASTERN POWER DEVICES, Ltd., TORONTO

SWITCHGEAR • UNIT SUBSTATIONS • ISOLATED PHASE BUS STRUCTURES • AUTOMATIC RECLOSING CIRCUIT BREAKERS

*FOR POWER SWITCHING EQUIPMENT, REFER TO RAILWAY AND INDUSTRIAL ENGINEERING CO., AN I-T-E ORGANIZATION

This tough paint job protects

KUHLMAN TRANSFORMER EFFICIENCY

for you

Give deterioration an inch and it'll take a mile. Allow rust, for example, to get its scaly grip on even a tiny portion of a transformer tank surface and it may eventually spread ruin throughout the entire transformer. We at Kuhlman *leave no opportunity for rust, moisture, and other destructive agents to get in their dirty work* when we build transformers for you.

This picture shows one of our workmen carefully applying heavy paint to every square inch of a Kuhlman Power Transformer case. The paint is flowed on, penetrating every pore and crevice of the case surface, *assuring lasting protection against deterioration.* You get top transformer efficiency that is durably protected when you buy Kuhlman Transformers. See your nearest Kuhlman representative *for complete information, or write direct.*

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

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